Service Manual

Model

CR200

Compact Disc Recorder

DANGER - LASER RADIATION WHEN OPEN.
AVOID DIRECT EXPOSURE TO BEAM.

FOSTEX®

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,

DO NOT REMOVE COVER (OR BACK).

NO USER-SERVICEABLE PARTS INSIDE.

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

CAUTION:

TO PREVENT ELECTRIC SHOCK, MATCH WIDE BLADE OF PLUG TO WIDE SLOT, FULLY INSERT.

ATTENTION:

POUR ÉVITER LES CHOCS ÉLECTRIQUES, INTRODUIRE LA LAME LA PLUS LARGE DE LA FICHE DANS LA BORNE CORRESPONDANTE DE LA PRISE ET POUSSER JUSQU' AU FOND.

The lightening flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

“WARNING”

“TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.”

SAFETY INSTRUCTIONS

1. Read instructions - All the safety and operating instructions should be read before the appliance is operated.
2. Retain instructions - The safety and operating instructions should be retained for future reference.
3. Heed warnings - All warnings on the appliance and in the operating instructions should be adhered to.
4. Follow instructions - All operating and use instructions should be followed.
5. Water and Moisture - The appliance should not be used near water - for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, and the like.
6. Carts and Stands - The appliance should be used only with a cart or stand that is recommended by the manufacturer.

An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

7. Wall or Ceiling Mounting - The appliance should be mounted to a wall or ceiling only as recommended by the manufacturer.
8. Ventilation - The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
9. Heat - The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.
10. Power Sources - The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
11. Grounding or Polarization - The precautions that should be taken so that the grounding or polarization means of an appliance is not defeated.
12. Power Cord Protection - Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
13. Cleaning - The appliance should be cleaned only as recommended by the manufacturer.
14. Nonuse Periods - The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
15. Object and Liquid Entry - Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
16. Damage requiring Service - The appliance should be serviced by qualified service personnel when:
    A. The power supply cord or the plug has been damaged; or
    B. Objects have fallen, or liquid has been spilled into the appliance; or
    C. The appliance has been exposed to rain; or
    D. The appliance does not appear to operate normally or exhibits a marked changed in performance; or
    E. The appliance has been dropped, or the enclosure damaged.
17. Servicing - The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

TABLE OF CONTENTS

1. CD-R THEORY 4
2. SPECIFICATIONS 7
3. CONTROLS, INDICATORS & CONNECTORS 10
4. ADJUSTING PROCEDURES 12
5. ADDITIONAL INFORMATION 39
6. EXPLODED VIEW, PCB ASSEMBLY & PARTS LIST 65
7. CIRCUIT & BLOCK DIAGRAMS. 77
8. TROUBLESHOOTING 85

NOTES

* Adjusting procedures are given in this manual which also includes a Parts List and circuit diagrams to assist the service technician in maintaining the Model CR200.

* The following accessory is supplied with CR200 as a standard.

Owner's manual, CR200	: 8288407000 (for export model)
Remote control unit Model 8317	: 8270829000
Audio cable (L : 1.2m)	: 8276912000
Power cable	: 8276910000 (for USA model)
	: 8276911000 (for EUR model)

* Following is the packing material for the Model CR200.

Carton, inner, CR200	: 8228718000
Carton, outer, CR200	: 8228897000
Packing, L, CR200	: 8228443000
Packing, R, CR200	: 8228444000

CAUTION

⚠ Parts marked with this sign are safety critical components. They must always be replaced with identical components. Refer to the Fostex Parts List and ensure exact replacement.

1. CD-R THEORY

1-1. Physical layout compared to CD

The conventional CD and CD-R discs basically have the same physical layout. However, as you can see from the Fig. 1, comparing to the conventional CD, the CD-R disc also has so-called “minus” areas such as PCA (Power Calibration Area) and PMA (Program Memory Area) where the temporary information is recorded.

• Unrecorded, blank disc

The information area is located next to the clamping area and the center hole. This area contains a pregroove with CLV (Constant Linear Velocity) clocking information and a time code.

• Partially recorded disc

The CD-R system gives the opportunity to record a disc in several actions at a different time on a different recorder. After the first recording, the information area is divided into five parts as shown below and in the right.

1: Power Calibration Area (PCA)
2: Program Memory Area (PMA)
3: Lead-in Area
4: Program Area
5: Lead-out Area

• Finalized disc

After finalizing the disc, the CD-R disc will become compatible with the RED Book (for regular CD) definitions and specifications. Therefore, it can be played back on conventional CD players. The Information Area of a finalized disc consists of three parts:

1: Lead-In Area
2: Program Area
3: Lead-Out Area

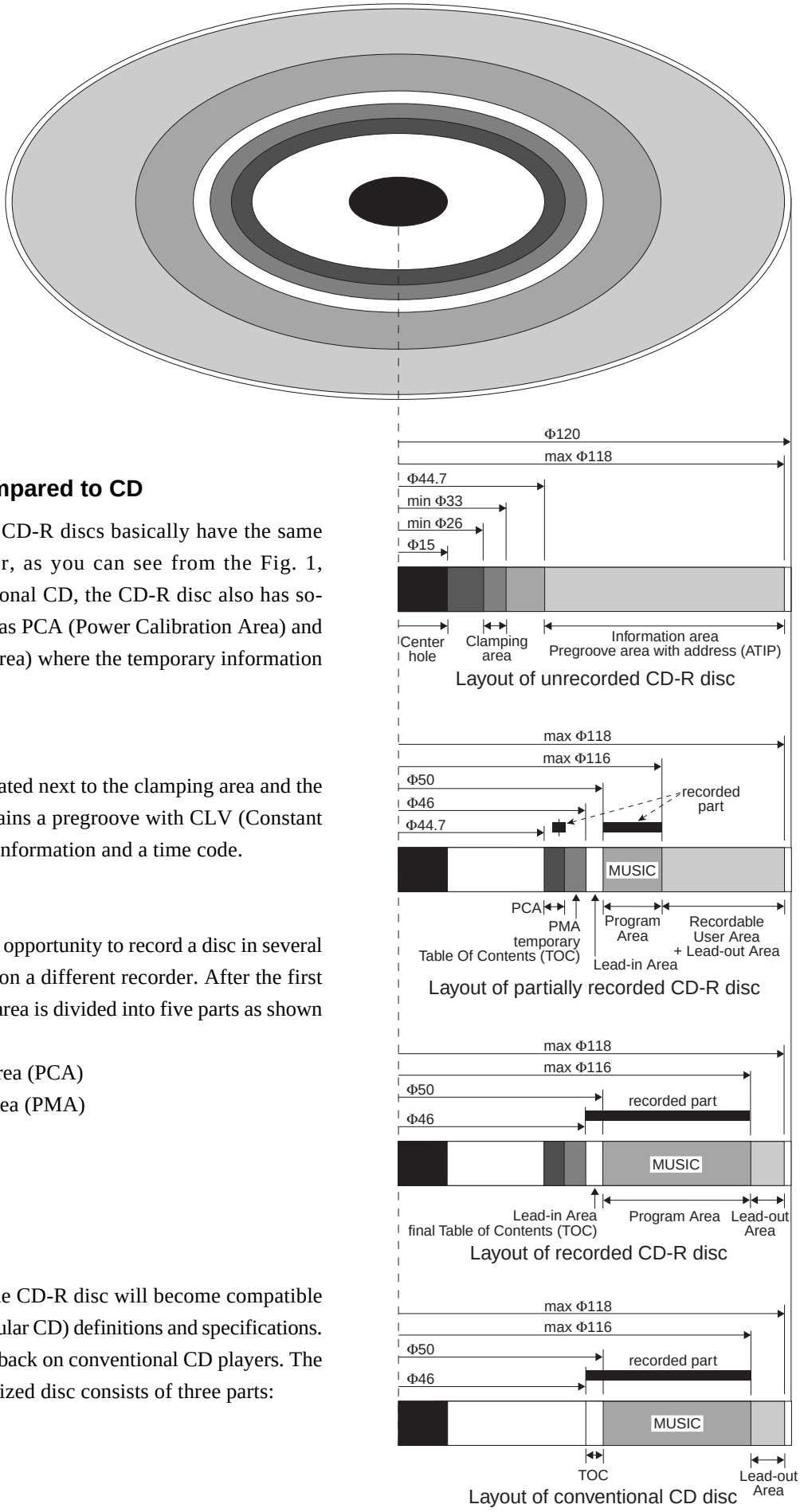


Fig. 1 Cross Section of CD-R & CD Disc

1-2. Pregrooved track wobbling + ATIP

When manufacturing the CD-R disc, it has been ÒpregroovedÓ. This pregroove in the CD-R disc is not a perfect spiral but is wobbled so that the CD-R disc can be recognized by a CD-R recorder even when it is completely blank.
It has many purposes. It not only helps keep the servo on an exact tracking of outgoing spiral but also the demodulated wobbling frequency contains the time information in digital format (21.05 kHz = Ò0Ó, 23.05 kHz = Ò1Ó). These frequencies have been selected so that the mean frequency is equal to Fs / 2 (= 22.05 kHz). Also the interleaved is the manufacturer's measured default laser power level.

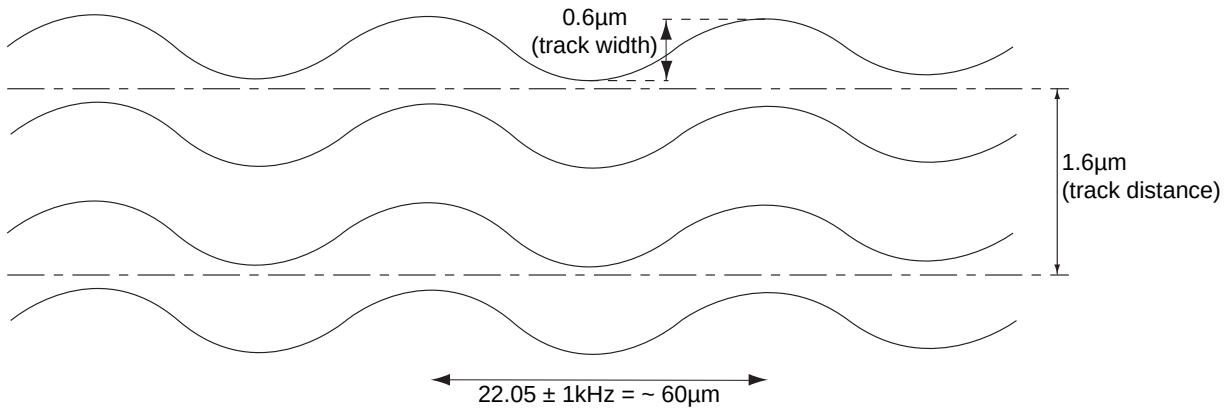


Fig. 2 Structure of Pregrooved Disc

1-3. PCA + consequence

Each recorder has a tolerance in the laser power and the dye from different manufacturers varies. In order to optimize the recorder / disc combination, there is a PCA (Power Calibration Area) included in the CD-R disk. This area consists of two parts, the Count Area and Test Area. In the Test Area, test recordings are made, stepping through several power levels. After playing back the recorded test signal, the optimum level is automatically determined. This value is memorized until the disk tray is opened. The Count Area keeps the track on how many of the test areas have been used indicating where to start the next test. The PCA is designed to accommodate for 100 tests. When the PCA is full, the default value written in the wobbled groove is used instead.

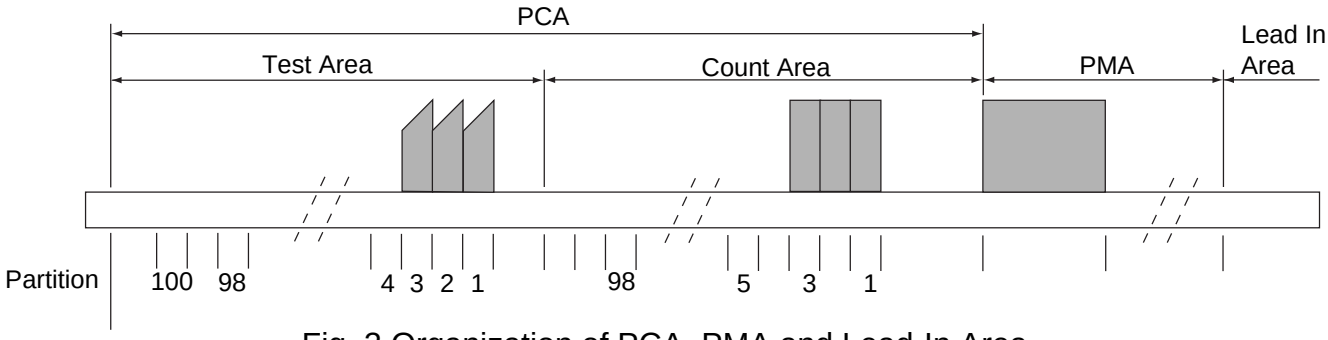


Fig. 3 Organization of PCA, PMA and Lead-In Area

CAUTION :

Every time the CD-R disc is inserted, one test is performed. Also if you leave the disc in the recorder at power off, a test will be performed when powering on. This might lead to the situation that the PCA might be fully used up even if there is a remaining space to record audio signal. The recordings made after the PCA is fully used up will not be optimal in performance.

1-4. CD-R Disc Structure and Bubbling Process

The materials of CD-R disc consists of label, protective layer, reflective layer, organic dye layer and transparent substrate.

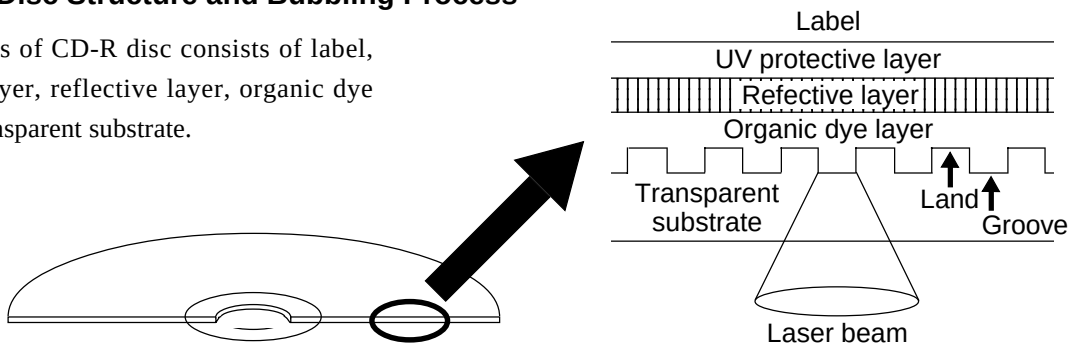


Fig. 4 Cross Section of CD-R disc

During recording, the laser is tracing the wobbled groove. When a pit is to be recorded, the laser fires off a high power beam and the organic dye will become black and deformed. This is the way a Ònon-reflectiveÓ part is created. When a groove is to be recorded, the laser is not fired and the high-reflective surface is maintained. If the data word contains successive the same information (e.g. 111 or 000), the pit will be continuous. When the data word contains changes, the pit - groove status will also change.

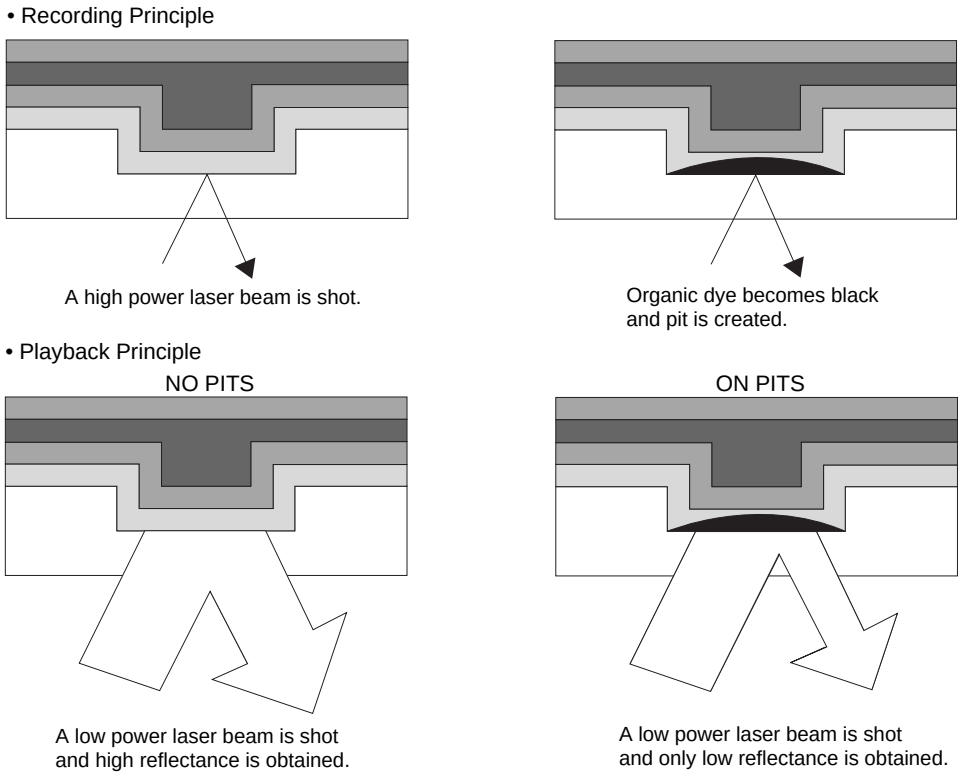

• Recording Principle
A high power laser beam is shot.
Organic dye becomes black and pit is created.
• Playback Principle
NO PITS
ON PITS
A low power laser beam is shot and high reflectance is obtained.
A low power laser beam is shot and only low reflectance is obtained.

Fig. 5 Recording & Playback Principle

1-5. Finalize

In order to be playable on an ordinal CD-player, the CD-R disc must have a corresponding data for TOC (Table Of Contents). This area is not used until all the recording is completed. Instead, a special area called PMA (Program Memory Area) is used.

When the disk is full or all the recording is completed, the disk can be finalized. This means that the temporary information in the PMA is checked and transferred to TOC. Now the disk is playable on an ordinal CD player but it will not be recordable any more.

2. SPECIFICATIONS

FUNCTIONS

Sampling rate converter	Fs : 48 kHz / 32 kHz → 44.1 kHz
Automatic disk distinction	
Time display switching	
Synchronous to one song / All songs / DAT ID	
REC mute	
Automatic power calibration	
Automatic track increment	
Manual track increment	
Automatic REC PAUSE	
Previous	End section of previous track can be reproduced during REC PAUSE mode.
Fader in / fader out	Can be controlled only by infra-red remote controller
Disk remaining time display	
Sampling monitor	
Skip play	
Track skip on / off	Can be controlled only by main unit key
One song / all songs program repeat	Can be controlled only by infra-red remote controller
Program play	
Manual search	
Track search	
Direct search	Can be controlled only by infra-red remote controller
Program setting / clear	Can be controlled only by infra-red remote controller
Input sensitivity switch	SW 1 (+4 dBu / -8 dBu, rear panel)
Infra-red remote controller on / off switch	SW 2 (rear panel)
Digital out on / off switch	SW 2 (rear panel)
Copy bit setting switch	SW 2 (No restriction / One time only / Prohibited, rear panel)

FL DISPLAY CONTENTS

PLAY
REC
PAUSE
REPEAT
1-REPEAT
AUTO TRACK No.
PROGRAM
TOC
Level meter
Track number
Input sampling frequency
Elapsed time
Remaining time
Total time
Remaining record time

GENERAL

Model	Compact disc recorder
Applicable discs	CDs and CD-Rs
Number of channels	2 channels (stereo)
Power supply	AC 120 V, 60 Hz
	AC 220 ~ 230 V, 50 / 60 Hz
Power consumption	21 W
Weight (without package)	6.2 kg / 13.7 lbs
Maximum dimensions	482 (W) x 134 (H) x 294 (D) mm
	18-31/32 (W) x 5-9/32 (H) x 11-9/16 (D) inch

AUDIO UNIT

Playback (CD)

Frequency characteristics	4 Hz ~ 20 kHz ± 1.0 dB
S/N	83 dB or more (EIAJ)
Dynamic range	83 dB or more (EIAJ)
Total harmonic distortion	0.01 % or less (EIAJ)
Channel separation	90 dB or more (EIAJ)
De-emphasis deviation	0 ± 1.5 dB or less (EIAJ)
Level difference between channels	1.0 dB or less (EIAJ)
Output voltage	2.4 V ± 0.3 V rms

Monitoring (analog RCA pin input)

Frequency characteristics	4 Hz ~ 20 kHz ± 1.0 dB
S/N	83 dB or more (EIAJ)
Dynamic range	83 dB or more (EIAJ)
Total harmonic distortion	0.01 % or less (EIAJ)
Maximum input level	3.2 V rms or more
Minimum input level	0.4 V rms or less

Record & Playback (analog RCA pin input)

Frequency characteristics	4 Hz ~ 20 kHz ± 1.0 dB
S/N	83 dB or more (EIAJ)
Dynamic range	83 dB or more (EIAJ)
Total harmonic distortion	0.01 % or less (EIAJ)

Monitoring (Digital coaxial input)

Frequency characteristics	4 Hz ~ 20 kHz ± 1.0 dB
S/N	95 dB or more (EIAJ)
Dynamic range	90 dB or more (EIAJ)
Total harmonic distortion	0.01 % or less (EIAJ)
Maximum input level	0.6 V rms or more
Minimum input level	0.2 V rms or less

Record & Playback (Digital coaxial input)

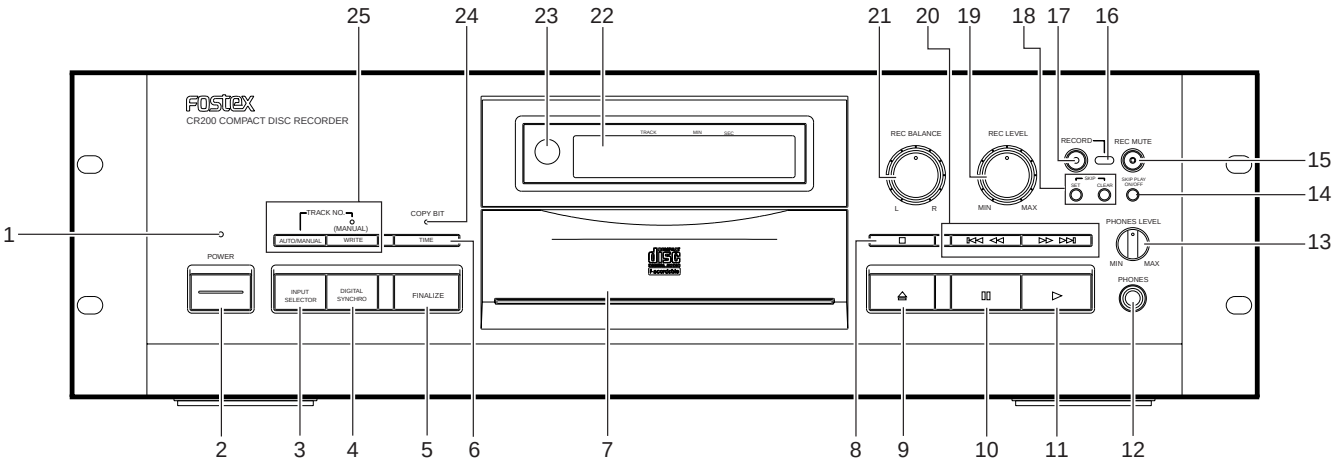
Frequency characteristics	4 Hz ~ 20 kHz ± 1.0 dB
S/N	90 dB (analog) / 105 dB (digital)
Dynamic range	90 dB (analog) / 95 dB (digital)
Total harmonic distortion	0.01 % (analog) / 0.003 % (digital)

INPUT / OUTPUT JACKS

- **Analog Input**
  - **XLR-3-31 type (x 2)**
    - **Standard input level** +4 dBu / -10 dBV (switchable)
    - **Input impedance** 10 k½
  - **RCA type (x 2)**
    - **Standard input level** -10 dBV
    - **Input impedance** 27 k½ or more
- **Analog Output (x 2)**
  - **RCA type**
    - **Standard output level** -10 dBV
    - **Load impedance** 10 k½
- **Digital Input**
  - **XLR-3-31 type** IEC958 Part 2 (AES/EBU)
  - **RCA type** IEC958 Part 3 (S/P DIF)
  - **Optical type** IEC958 Part 3 (S/P DIF)
- **Digital Output**
  - **RCA type** IEC958 Part 3 (S/P DIF)
  - **Optical type** IEC958 Part 3 (S/P DIF)
- **Parallel remote** DIN 8-pin connector (Outer shell is grounded.)

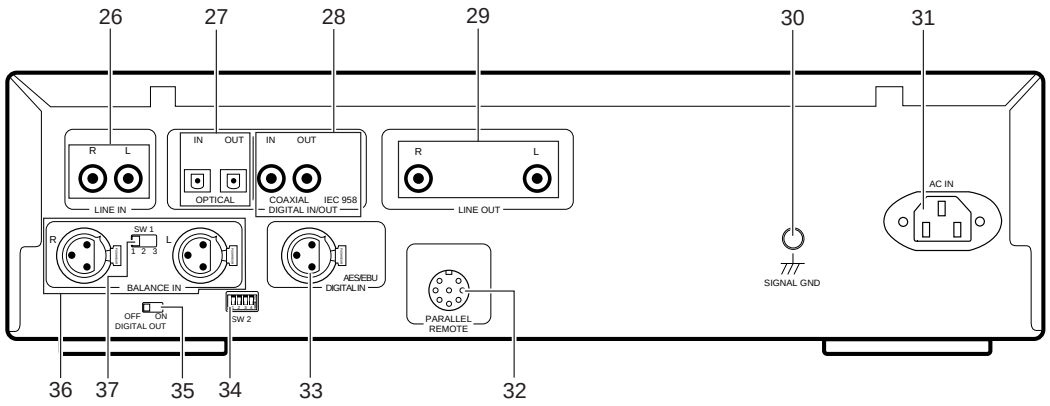
  Pin 1 : PAUSE
  Pin 2 : ⏮
  Pin 3 : PLAY
  Pin 4 : NC
  Pin 5 : Manual track write
  Pin 6 : REC
  Pin 7 : ⏭
  Pin 8 : STOP

3. CONTROLS, INDICATORS & CONNECTORS



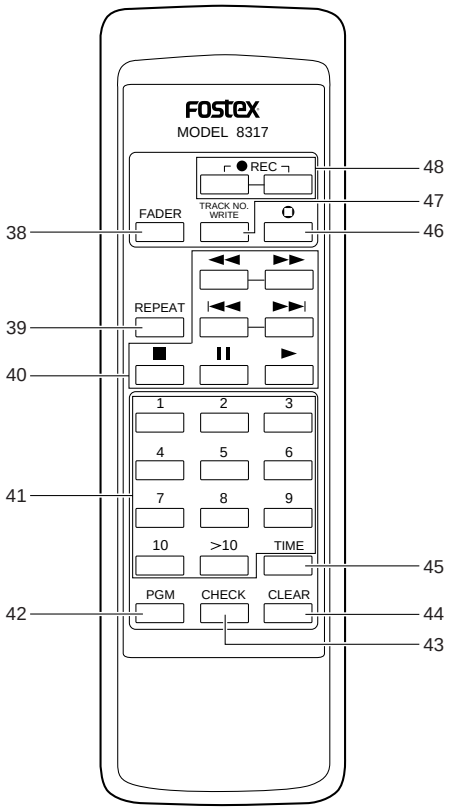
< Front Panel Section >

1. Power indicator
2. Power switch [POWER]
3. Input selector button [INPUT SELECTOR]
4. Digital synchro button [DIGITAL SYNCHRO]
5. Finalize button [FINALIZE]
6. Time button [TIME]
7. Disc tray
8. Stop button [■]
9. Open/close button [⏏]
10. Pause button [⏸]
11. Play button [▶]
12. Headphone jack [PHONES]
13. Headphone level control [PHONES LEVEL]
14. Skip play on/off switch [SKIP PLAY ON/OFF]
15. Record muting button [REC MUTE]
16. Record indicator
17. Record button [RECORD]
18. Track skip buttons [SKIP SET, CLEAR]
19. Record level control [REC LEVEL]
20. Track search buttons [⏮◀◀][▶▶⏭]
21. Record balance control [REC BALANCE]
22. Display panel
23. Remote control sensor
24. Copy bit indicator [COPY BIT]
25. Track no. write button
    [TRACK NO. AUTO/MANUAL, WRITE]



< Rear Panel Section >

26. Analog line input connectors [LINE IN L, R]
27. Digital input/output connectors [OPTICAL IN, OUT]
28. Digital input/output connectors [COAXIAL IN, OUT]
29. Analog line output connectors [LINE OUT]
30. GND terminal [SIGNAL GND]
31. AC inlet [AC IN]
32. Parallel remote connector [PARALLEL REMOTE]
33. Digital input connector [AES/EBU DIGITAL IN]
34. Dip switch [SW 2]
35. Digital out on/off switch [DIGITAL OUT OFF/ON]
36. Analog balanced input connectors [BALANCE IN]
37. Input select switch [SW 1]



< Remote Controller Section >

38. Fader button [FADER]
39. Repeat button [REPEAT]
40. Manual search buttons [◀◀][▶▶]
    Track search buttons [⏮][⏭]
    Stop button [■]
    Pause button [⏸]
    Play button [▶]
41. Numeric buttons [1 to 10, >10]
42. Program button [PGM]
43. Program check button [CHECK]
44. Program clear button [CLEAR]
45. Time button [TIME]
46. Record muting button [○]
47. Manual track no. write button [TRACK NO. WRITE]
48. Record button [● REC]

4. ADJUSTING PROCEDURES

4-1. ADJUSTING PROCEDURES

Even if nothing is wrong with the pickup section and hardware components in the circuits, due to the misalignment of various adjustments, there is a possibility that the CR200 does not work properly or at all. According to the following procedures, make adjustments correctly.

● Test equipment and adjusting tools

- Dual trace oscilloscope, 100MHz or higher bandwidth
- Sinewave signal generator
- Test disk: TCD-785 (Almedio) and STD-R03 (Pioneer)
- Low pass filter
  15k½ + 0.001µF x 2 pcs.
  39k½ + 0.001µF x 1 pc.
- High pass filter
  3.9k½ + 180pF x 1 pc.
- Resistor
  100k½
- Hex wrench: 1.27mm diagonal
- Regular tools such as a pair of tweezers, cutter, long-nose pliers and minus screw driver
- Ceramic screw driver. Vessel 9000 series are recommended.
- Digital multimeter (measuring voltage: less than 1mV)

● Table of adjusting item / test point / pot

Adjustment 1

No.	Item	Test Point	Pot
1	Playback power adjustment	CN104 Pin-7 (PWAJT)	VR103 (PB. PW)
2	Coarse focus offset adjustment	CN204 Pin-1 (RF)	VR105 (FE. OFS)
3	Coarse skew adjustment	CN204 Pin-1 (RF)	Radial adjustment screw Tangential adjusting screw
4	Coarse grating adjustment	CN104 Pin-3 (TE)	Grating adjustment screw
5	DPP (tracking offset) adjustment	CN104 Pin-3 (TE)	VR112 (TE. OFS)
6	Fine focus offset adjustment	CN204 Pin-1 (RF)	VR105 (FE. OFS)
7	Fine skew adjustment	CN204 Pin-1 (RF)	Radial adjustment screw Tangential adjusting screw
8	Grating readjustment	CN104 Pin-3 (TE)	Grating adjustment screw

Adjustment 2

No.	Item	Test Point	Pot
1	CD-R VCO control voltage adjustment	CN331 Pin-1 (VCOIN)	VR301 (VCO CON)
2	Multi pulse time adjustment	CN3506 Pin-6 (MPLS)	VR3501 (MPLS DLY)
3	EFM rising edge time adjustment	CN3506 Pin-5 (EFMIN) CN3506 Pin-4 (SEFM)	VR3502 (EFM DLY)
4	3T rising edge time adjustment	CN3506 Pin-3 (3TIN) CN3506 Pin-2 (3TOUT)	VR3503 (3T DLY)
5	WBL + offset adjustment	CN104 Pin-6 (RWBL)	VR107 (WBL+. OFS)
6	Coarse WBL offset adjustment	CN104 Pin-5 (WBL)	VR108 (WBL. OFS)
7	RF offset adjustment	CN204 Pin-1 (RF)	VR121 (RF. OFS)
8	Playback power readjustment	CN104 Pin-7 (PWAJT)	VR103 (PB. PW)
9	Coarse focus offset adjustment	CN204 Pin-1 (RF)	VR105 (FE. OFS)
10	Main and sub mix ratio adjustment	CN104 Pin-1 (STE) CN104 Pin-2 (MSTE)	VR110 (MS. MIX)
11	Tracking amp. gain adjustment	CN104 Pin-3 (TE)	VR111 (TE. GAIN)

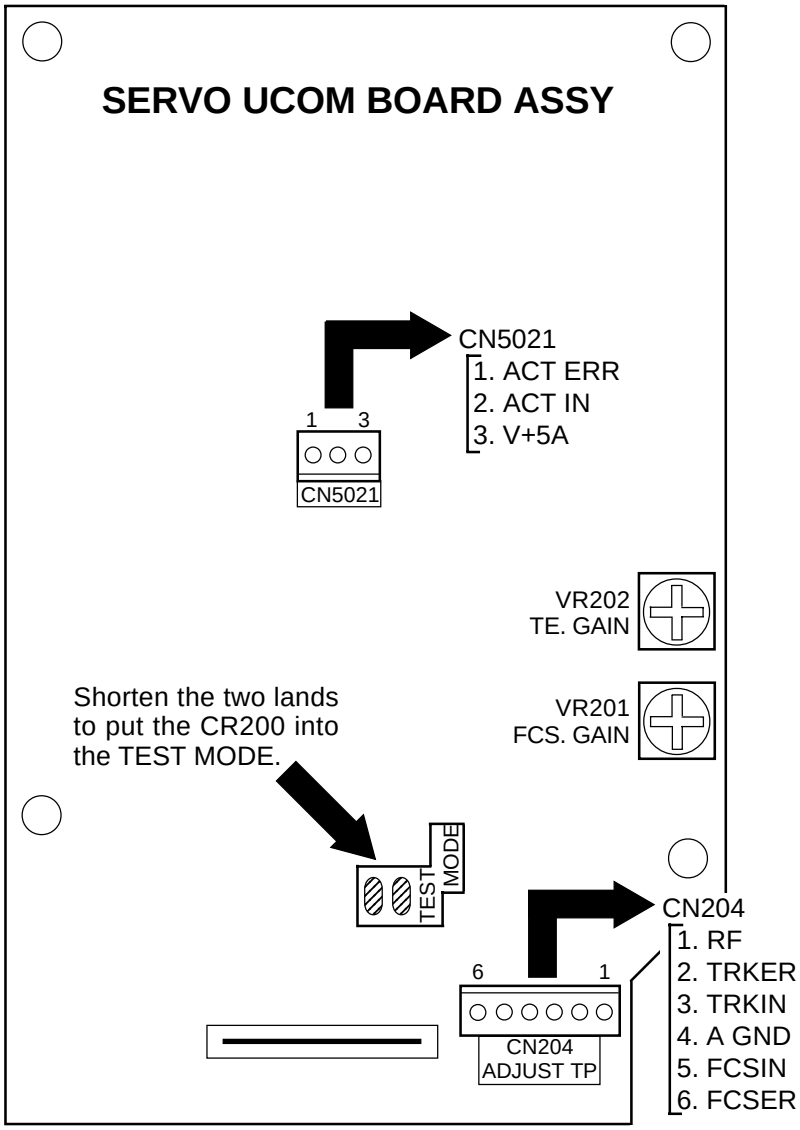


Fig. 6

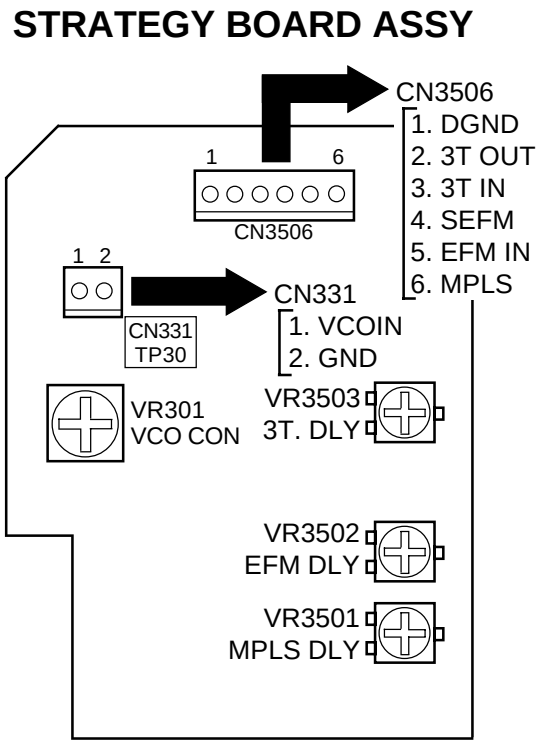


Fig. 7

Adjustment 2 (continued)

No.	Item	Test Point	Pot
12	Tracking offset adjustment	CN104 Pin-3 (TE)	VR112 (TE. OFS)
13	ACT offset adfjustment	CN5021 Pin-1 (ACT ERR)	VR1 (ACT. OFS)
14	ACT gain adjustment	CN5021 Pin-1 (ACT ERR)	VR10 (ACT. GAIN)
15	Fine focus offset adjustment	CN204 Pin-1 (RF)	VR105 (FE. OFS)
16	WBL balance adjustment	CN104 Pin-5 (WBL)	VR106 (WBL. BALANCE)
17	Fine WBL offset adjustment	CN104 Pin-5 (WBL)	VR108 (WBL. OFS)
18	WBL focus offset adjustment	CN104 Pin-5 (WBL)	VR115 (WFE. OFS)
19	Recording power adjustment	CN104 Pin-7 (PWAJT)	VR104 (REC. PW)
20	HF amp. gain adjustmnet	CN104 Pin-8 (HF)	VR119 (HF. GAIN)
21	Focus servo loop gain adjustment	CN204 Pin-5 (FCSIN) CN204 Pin-6 (FCSER)	VR201 (FCS. GAIN)
22	Tracking servo loop gain adjustment	CN204 Pin-2 (TRKER) CN204 Pin-3 (TRKIN)	VR202 (TE. GAIN)

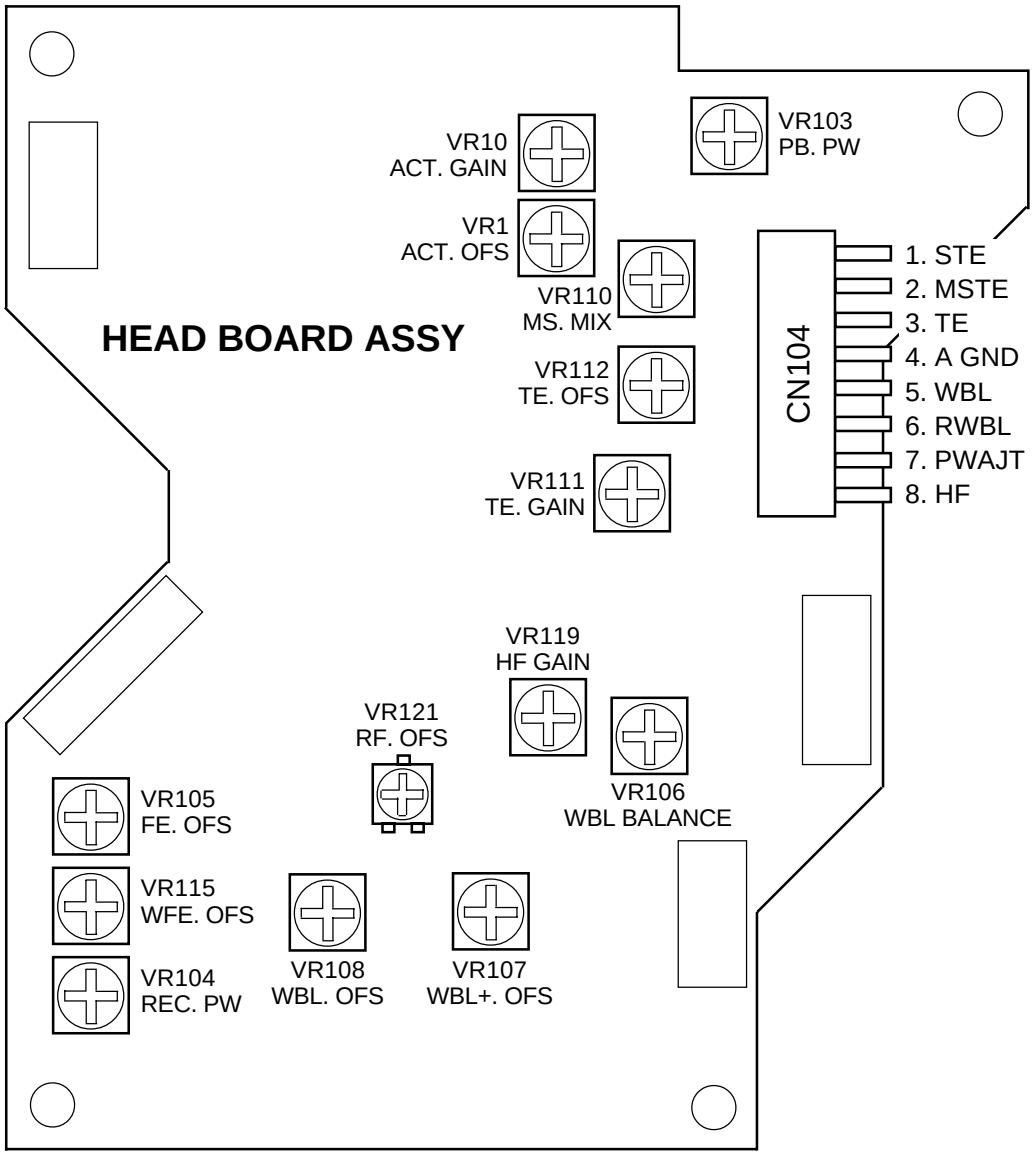


Fig. 8

● Notes

(1) Use a 10 : 1 probe for the oscilloscope.

(2) All the knob positions (settings) for the oscilloscope in the adjustment procedures are for when a 10 : 1 probe is used.

● Test Mode

This model has a test mode so that the adjustments and checking required for servicing can be carried out easily.

When this model is put into test mode, the keys on the front panel would work differently from normal condition. Adjustments and checks can be carried out by operating these keys with the correct procedures. On this model, all adjustments are carried out in test mode.

[Setting to Test Mode]

The way to set this model into test mode.

(1) Plug the power cord back into the AC socket.

(2) Shorten the test mode lands. (See Fig. 6.)

(3) Press the Power SW ON.

When the test mode is set correctly, the display is different from what it usually is when the power is turned on. (lights up all FL display) If the display is still the same as usual, test mode has not been set correctly, so repeat Steps 1 Ð 3.

[Release from Test Mode]

Here is the procedure for releasing the test mode.

(1) Press the STOP key and stop all operations.

(2) Press the Power SW OFF.

[Operations of the Keys in Test Mode]

Code	Key Name	Function in Test Mode	Explanation
	DIGITAL SYNCHRO	Playback laser diode ON	Lights up the laser diode by playback power.
	FINALIZE	Focus servo closes	The laser diode is lit up and the focus actuator is lowered, then raised slowly and the focus servo is closed at the point where the objective lens is focused on the disc. With the player in this state, if you slightly rotate the stopped disc by hand, you can hear the sound of focus servo. If you can hear this sound, the focus servo is operating correctly. If you press the key with no disc mounted, the laser diode lights up, the focus actuator is pulled down, then the actuator is raised and lowered three times and returned to its original position.
▶	PLAY	Spindle servo ON	Starts the spindle motor in the clockwise direction and when the laser rotation reaches the prescribed speed (about 500 rpm at the inner periphery), set the servo in a closed loop.
⏸	PAUSE	Tracking servo close/open	Pressing this key when the focus servo and spindle servo are operating correctly in closed loops puts the tracking servo into a closed loop, displays the track number being played back and the elapsed time on the front panel. If the elapsed time is not displayed or not counted correctly, it may be that something is out of adjustment, or that there is some other problem. This key is a toggle key and open/close the tracking servo alternately. This key has no effect if no disc is mounted.

Code	Key Name	Function in Test Mode	Explanation
◀◀ • I◀◀	MANUAL/ TRACK SEARCH REV	Carriage reverse (inwards)	Moves the pickup position toward the inner diameter of the disc. When this key is pressed with the tracking servo in a closed loop, the tracking servo automatically goes into an open loop. Since the motor does not automatically stop at the mechanical end point in test mode, be careful with this operation.
▶▶ • ▶▶I	MANUAL/ TRACK SEARCH FWD	Carriage forward (outwards)	Moves the pickup position toward the outer diameter of the disc. When this key is pressed with the tracking servo in a closed loop, the tracking servo automatically goes into an open loop. Since the motor does not automatically stop at the mechanical end point in test mode, be careful with this operation.
■	STOP	Stop	Initializes and the disc rotation stops. The pickup and disc remain where they are when this key is pressed.
▲	OPEN/CLOSE	Disc tray open/close	Open/close the disc tray. This key is a toggle key and open/close tray alternately. Pressing this key when the disc is turning stops the disc, then opens the tray. This key operation does not affect the position of the pickup.
● ↓ ▢	RECORD ↓ REC MUTE	Maximum recording power Laser diode ON	Lights up the laser diode with maximum recording power and normal EFM by pressing REC and REC MUTE keys in order. * The laser diode may be damaged if adjustments are made before pressing these keys.
	AUTO/ MANUAL	Focus offset servo	Switches the focus offset state. COPY BIT LED Lights UP: C/N in the best condition Lights OFF: Jitter in the best condition
	WRITE	Optical axis servo switching	Switches the ON/OFF of the optical axis servo. (MANUAL) LED Lights UP: Optical axis servo ON Light OFF: Optical axis servo OFF
	TIME	Search to the lead of disc. (It works only CD-R use.)	When using the CD-R disc, search to the lead (0 min. 0 sec.) of disc. (It doesn't work in CD disc use.)

[How to Play Back a Disc in Test Mode]

In test mode, each servo operates independently. Thus, it is required to press the keys and close the servo in a correct order so that a disc can be played

Here is the key operation sequence for playing back a disc in test mode.

FINALIZE — Lights up the laser diode and closes the focus servo.

↓

PLAY ▶ — Starts the spindle motor and closes the spindle servo.

↓

PAUSE ▌▌ — Closes the tracking servo.

Wait at least 2 ~ 3 seconds between each of these operations.

4.2 Adjustment 1

4.2.1 Playback Power Adjustment

DANGER - LASER RADIATION WHEN OPEN.
AVOID DIRECT EXPOSURE TO BEAM.

• Objective	To optimize the playback power of the laser diode.
• Symptom when out of adjustment	Does not start playing, track search is impossible, tracks are skipped.
• Measurement instrument connections	Multimeter to **CN104, Pin-7 (PWAJT) (HEAD BOARD assy)**
	GND probe can be connected to CN104, Pin-4 (AGND).
• Disc	None needed
• Player state	Test mode, Playback laser diode ON
• Adjustment location	**VR103 (PB. PW) (HEAD BOARD assy)**

CAUTION:

(a) Perform this adjustment more than 5 minutes after starting up the test mode.
(b) This adjustment cannot be performed accurately if disc is inserted. Be sure to remove disc first before adjustments.
(c) If the specified voltage is not obtained by turning VR103, the pickup assy might be defective. Also be careful not to get the pickup lens dirty.

[Procedures]

• When adjusting with the multimeter.

(1) Lights up the playback laser diode using the DIGITAL SYNCHRO key.
(2) Adjust the voltage value of Pin-7 (PWAJT) of CN104 (TP1) to the voltage value (PB PW voltage ± 5mV) displayed on the pickup flexible cable using VR103 (PB PW).

• Reference: When adjusting with the optical power meter.

(1) Move the pickup to the outer edge of the disc with the MANUAL / TRACK SEARCH FWD key.
(2) Lights up the playback laser diode by the DIGITAL SYNCHRO key.
(3) Shine the light discharged from the objective lens in the pickup on the light power meter sensor. Adjust VR103 (PB. PW) so that the playback laser diode output is an average 0.65 mW ± 0.05mW.
(Wavelength 790nm, Average mode)

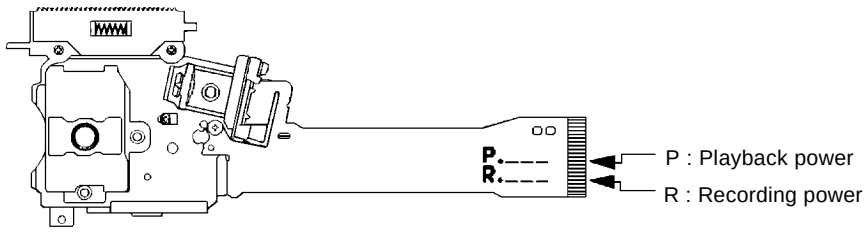


Fig. 9

* Recording on the disc is not possible in test mode.

4.2.2 Coarse Focus Offset Adjustment

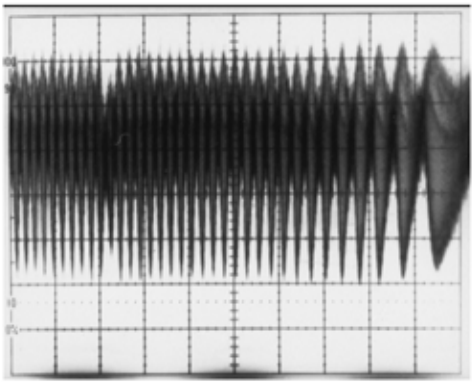
• Objective	To coarse adjust the DC offset voltage of the focus servo circuit to perform the tracking and slider adjustments correctly.
• Symptom when out of adjustment	The unit does not focus in, sound is cracking and the RF signal is dirty.
• Measurement instrument connections	Osciloscope to **CN204, Pin-1 (RF) (SERVO UCOM BOARDassy)** GND probe can be connected to CN204, Pin-4 (AGND). [Settings]: 20 mV/div., 2 mS/div., DC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open
• Adjustment location	**VR105 (FE. OFS) (HEAD BOARD assy)**

[Procedures]

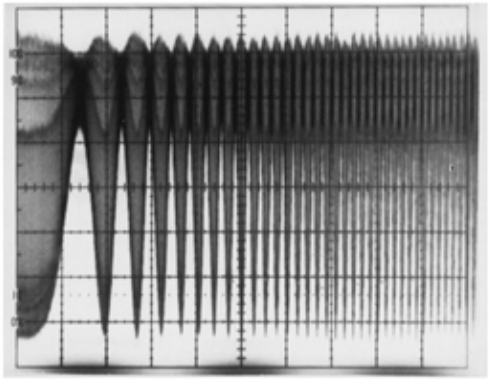
(1) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then the spindle servo.

(2) Adjust VR105 (FE. OFS) so that the amplitude of waveform at CN204 (TP201), Pin-1 (RF) is maximum.

NOTE: The oscilloscope displays a moving image, not a ÒSTILLÓ image as shown below. In order to verify that the focus servo is on, tap on the machine gently and listen to the sound indicating the servo operation.



Out of adjustment



Optimum adjustment
(Waveform amplitude is at maximum.)

Fig. 10

4.2.3 Coarse Skew Adjustment

• Objective	To coarse adjust the angle of pickup to the disc for performing the grating and DPP (tracking offset) adjustments correctly.
• Symptom when out of adjustment	Sound is cracking, some discs can be played but not others.
• Measurement instrument connections	Oscilloscope to **CN204, Pin-1 (RF) (SERVO UCOM BOARD assy)** GND probe can be connected to CN204, Pin-4 (AGND). [Settings]: 20 mV/div., 200 nS/div., AC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open
• Adjustment location	**Radial adjustment screw and tangential adjustment screw**

CAUTION:

Before executing this adjustment, you must cut a few wire binders, disconnect cable and loosen 4 screws so that the HEAD BOARD assy can be tilted up and fixed into the slits.

[Procedures]

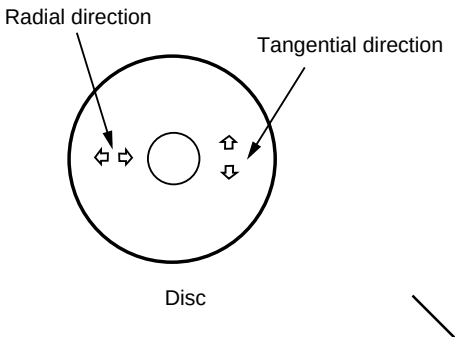
(1) Move the pickup to the position where the radial/tangential adjustment screws will be seen with the MANUAL / TRACK SEARCH FWD or REV keys so that the radial/tangential adjustment screws can be adjusted.

(2) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then the spindle servo.

(3) Adjust the RAD (radial direction) and TAN (tangential direction) adjustment screws alternately with hexagonal screwdriver (1.27 mm diagonal) to maximize the RF output at CN204 (TP201), Pin-1.

NOTE:

Radial direction and tangential direction mean the direction relative to the disc shown in Fig. 11.



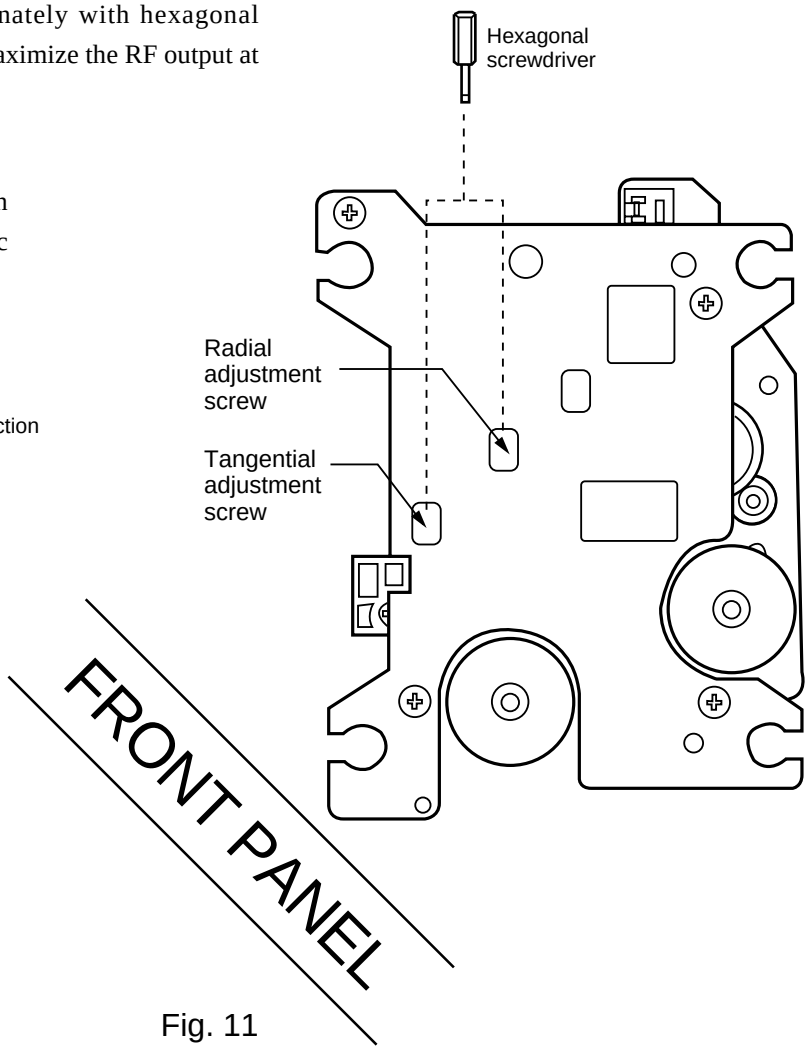


Fig. 11

4.2.4 Coarse Grating Adjustment

• Objective	To align the tracking error generation laser beam spots to the optimum angle on the track.
• Symptom when out of adjustment	Does not start playing, track search is impossible, tracks are skipped.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-3 (TE)** via a low pass filter. **(HEAD BOARD assy)** See Fig. 14 below. GND probe can be connected to CN104, Pin-4 (AGND). [Settings]: 50 mV/div., 5 mS/div., DC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open.
• Adjustment location	**Grating adjustment screw in the slit**

[Procedures]

(1) Move the pickup to the position where the grating adjustment slit will be seen with the MANUAL / TRACK SEARCH FWD or REV keys so that the grating adjustment can be adjusted.

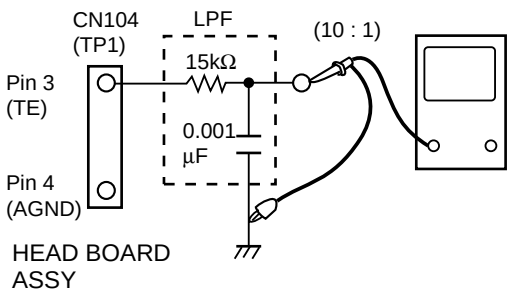
(2) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then spindle servo.

(3) Insert a screwdriver into the grating adjustment slit and adjust the grating to find the null point.
For more details, see next page.

(4) If you slowly turn the screwdriver clockwise from the null point, the amplitude of the wave gradually increases. Then, if you continue turning the screwdriver, the amplitude of the wave becomes smaller again. Turn the screwdriver counterclockwise from the null point and set the grating to the first point where the wave amplitude reaches its maximum.

Reference : Fig. 13 shows the relation between the angle of the tracking beam with the track and the waveform.

(5) Return the pickup to more or less midway across disc with the MANUAL / TRACK SEARCH key. Then, press the PAUSE key and check that the track number and elapsed time are displayed on the front panel. If they are not displayed at this time or the elapsed time changes irregularly, check the null point and adjust the grating again.



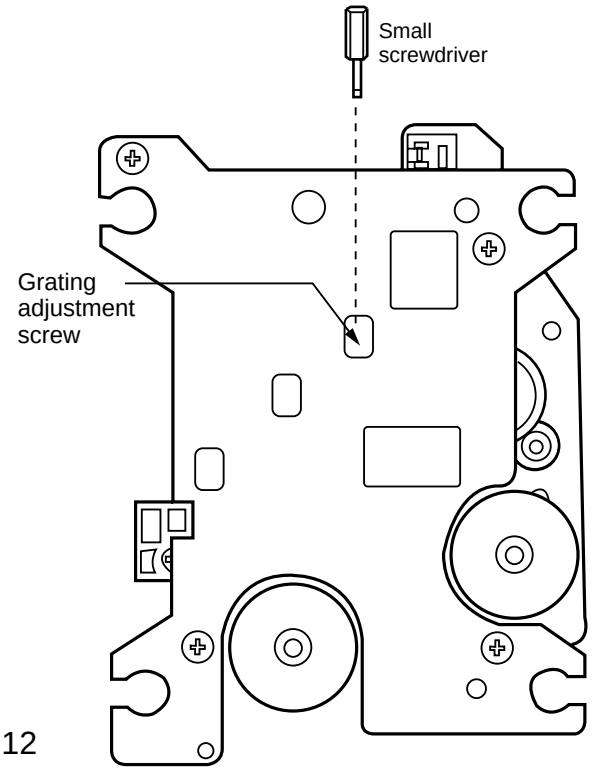
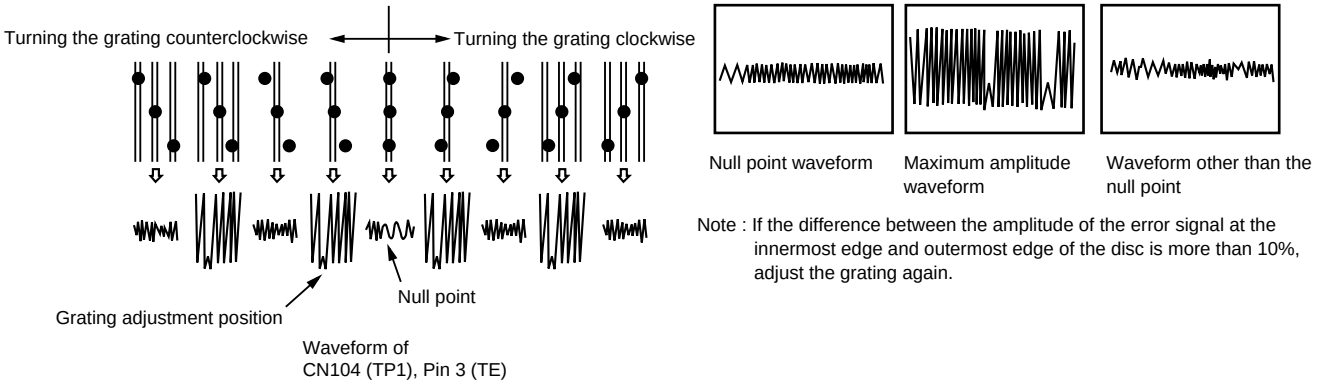


Fig. 12

[How to find the null point]

When you insert the small screwdriver into the slit for the grating adjustment and change the grating angle, the amplitude of the tracking error signal at CN104 (TP1), Pin 3 (TE) changes. Within the range for the grating, there are five or six locations where the amplitude of the wave reaches a minimum. Of these five or six locations, there is only one at which the envelope of the waveform is smooth. This location is where the three laser beams divided by the grating are all right above the same track. (See Fig. 13.)

This point is called the null point. When adjusting the grating, this null point is found and used as the reference position.



Note : If the difference between the amplitude of the error signal at the innermost edge and outermost edge of the disc is more than 10%, adjust the grating again.

Fig. 13

4.2.5 DPP (Tracking Offset) Adjustment

• Objective	To correct for the variation in the sensitivity of the tracking photodiode.
• Symptom when out of adjustment	The unit does not playback, track search is impossible, tracks are skipped.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-3 (TE)**
	[This connection must be via a low pass filter (15kW + 0.001μF).]
	GND probe can be connected to CN104, Pin-4 (AGND).
	[Settings]: 50 mV/div., 5 mS/div., DC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open.
• Adjustment location	**VR112 (TE. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to the midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.

(2) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then spindle servo.

(3) Line up the bright line (ground) at the center of the oscilloscope screen and put the oscilloscope into DC mode.

(4) Adjust VR112 (TE. OFS) so that the positive amplitude and negative amplitude of the tracking error signal at CN104, Pin-3 (TE) are the same (in other words, so that there is no DC component).

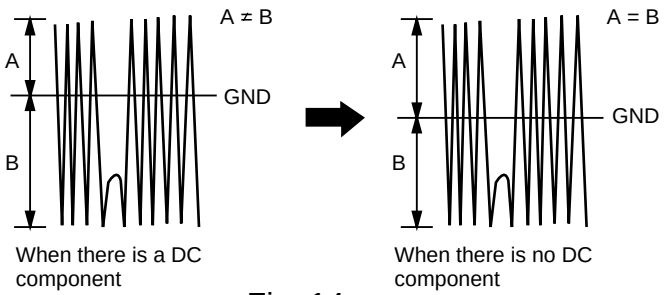


Fig. 14

4.2.6 Fine Focus Offset Adjustment

• Objective	To optimize the DC offset voltage of the focus servo circuit.
• Symptom when out of adjustment	The unit does not focus in, sound is caracking and the RF signal is dirty.
• Measurement instrument connections	Oscilloscope to **CN204, Pin-1 (RF) (SERVO UCOM BOARD assy)** GND probe can be connected to CN204, Pin-4 (AGND). [Settings]: 20 mV/div., 500 nS/div., AC mode
• Disc	TCD-785
• Player state	Test mode, play
• Adjustment location	**VR105 (FE. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.

(2) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the player into play mode.

(3) Adjust VR105 (FE. OFS) so that the 3T waveform at CN204, Pin-1 (RF) is maximum.

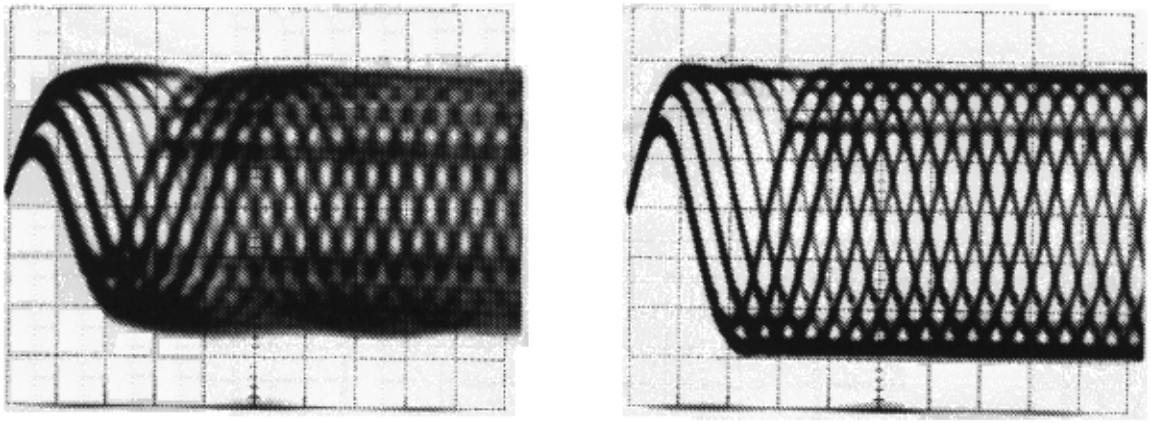


Fig. 15

4.2.7 Fine Skew Adjustment

• Objective	To adjust the angle of the pickup relative to the disc so that the laser beams are shone straight down into the disc for the best read out of the RF signals.
• Symptom when out of adjustment	Sound is cracking, some discs can be played but not others..
• Measurement instrument connections	Oscilloscope to **CN204, Pin-1 (RF) (SERVO UCOM BOARD assy)** GND probe can be connected to CN204, Pin-4 (AGND). [Settings]: 20 mV/div., 200 nS/div., AC mode
• Disc	TCD-785
• Player state	Test mode, play
• Adjustment location	**Pickup radial adjustment screw and tangential adjustment screw**

[Procedures]

(1) Move the pickup to the position where the radial/tangential adjustment screws will be seen with the MANUAL / TRACK SEARCH FWD or REV keys so that the radial/tangential adjustment screws can be adjusted.

(2) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the player into play mode.

(3) First, adjust the radial adjustment screw with the hexagonal screwdriver (1.27 mm) so that the eye pattern (the diamond shape at the center of the RF signal) can be seen the most clearly and the amplitude is at maximum..

(4) Next, adjust the tangential adjustment screw with the hexagonal screwdriver so that the eye pattern can be seen the most clearly. (Fig. 17).

(5) Adjust in the order of the radial adjustment screw and the tangential screw again, so that the eye pattern can be seen the most clearly. As necessary, adjust the two screws alternately so that the eye pattern can be seen the most clearly.

(6) After the adjustment, remove the float screw, turn over the servo mechanism assembly, then secure the radial adjustment screw and the tangential adjustment screw with loc-tite.

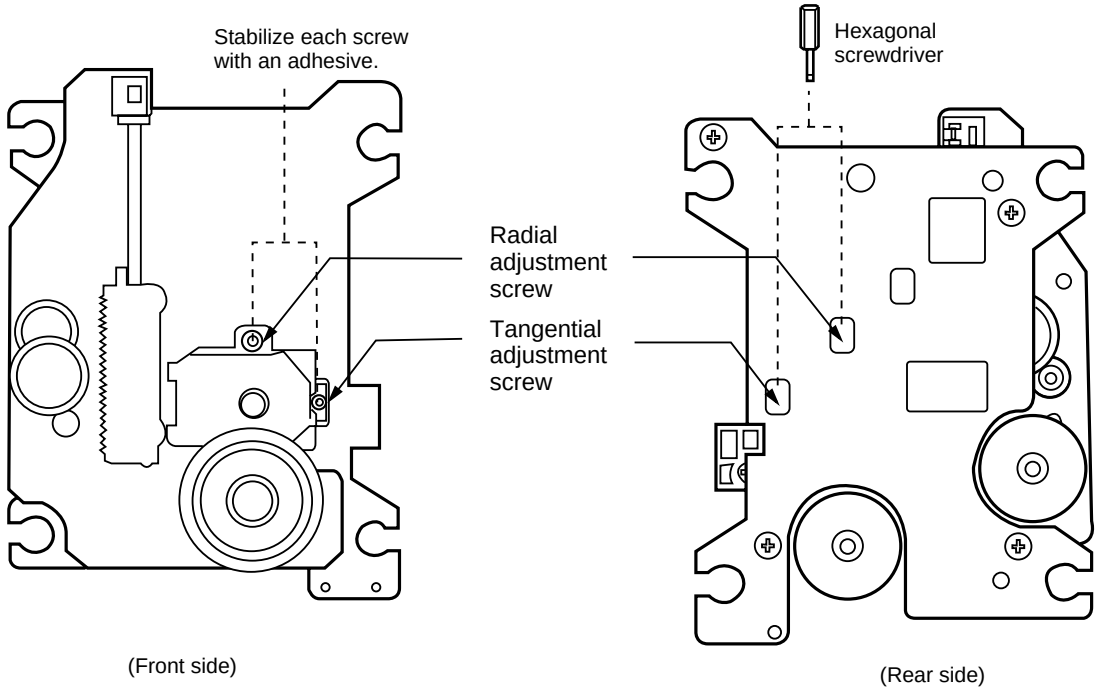


Fig. 16

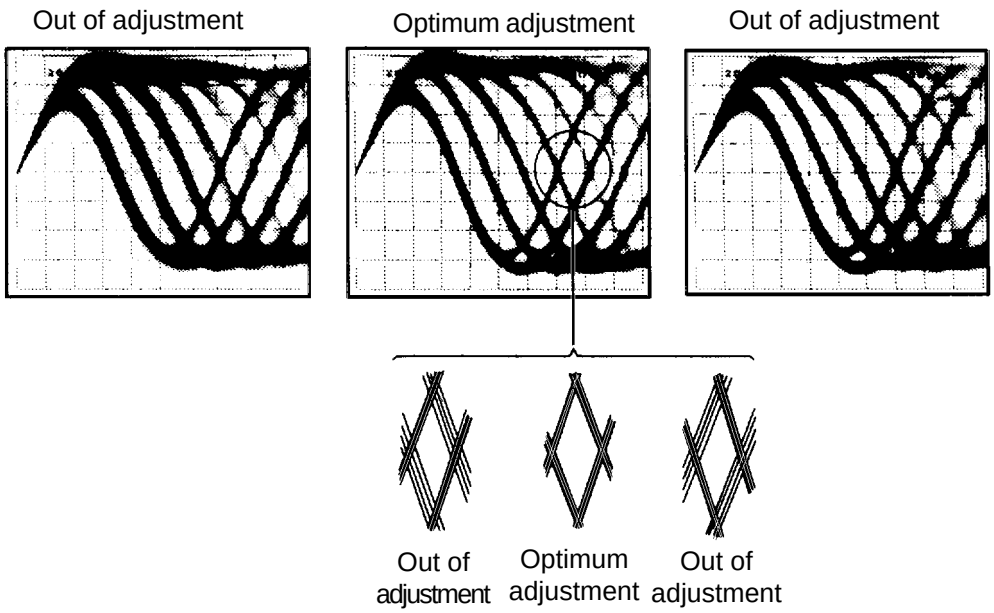


Fig. 17

4.2.8 Grating Re-adjustment

Adjust in the same manner as "4.2.4 Coarse Grating Adjustment ".

4.3 Adjustment 2

4.3.1 CD-R VCO Control Voltage Adjustment

• Objective	To optimize the CD-R VCO control voltage adjustment of VCO IC.
• Symptom when out of adjustment	The unit does not record or playback CD-R discs.
• Measurement instrument connections	Multimeter to **CN331, Pin-1 (VCOIN) (STRATEGY BOARD assy)**
	GND probe can be connected to CN331, Pin-2 (GND).
• Disc	None needed
• Player state	Test mode, stop
• Adjustment location	**VR301 (VCOIN) (STRATEGY BOARD assy)**

[Procedures]

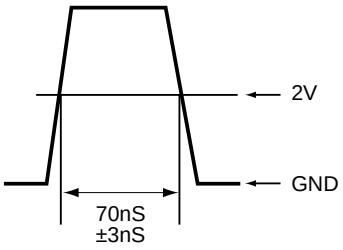
(1) Adjust VR301 (VCO CON) so that the voltage at Pin 1 (VCOIN) of CN331 (TP30) becomes 2.5 ± 0.1V.

4.3.2 Multi Pulse Time Adjustment

• Objective	Pulse adjustment for recording (1)
• Symptom when out of adjustment	The unit does not playback CD-R discs which was recorded with this player .
• Measurement instrument connections	Oscilloscope to **CN3506, Pin-6 (MPLS) (STRATEGY BOARD assy)**
	GND probe can be connected to CN3506, Pin-1 (DGND).
	[Settings]: 1 V/div., 20 nS/div., DC mode
• Disc	None needed
• Player state	Test mode, stop
• Adjustment location	**VR3501 (MPLS DLY) (STRATEGY BOARD assy)**

[Procedures]

(1) Disconnect a connector CN3502 (white wires with green connector).
(2) Adjust the time from rising edge to falling edge of Waveform with 2V level.
(3) Adjust VR3501 (MPLS DLY) so that the DC voltage at CN3506 pin-6 (MPLS) becomes 70nS ± 3nS.
(4) Press the STOP key.
(5) Connect a connector CN3502.

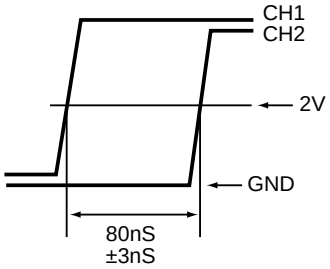


4.3.3 EFM Rising Edge Time Adjustment

• Objective	Pulse adjustment for recording (2)
• Symptom when out of adjustment	The unit does not playback CD-R discs which was recorded with this player .
• Measurement instrument connections	Oscilloscope to
	CH1 : CN3506, Pin-5 (EFM IN) (STRATEGY BOARD assy)
	CH2 : CN3506, Pin-4 (SEFM) (STRATEGY BOARD assy)
	GND probe can be connected to CN3506, Pin-1 (DGND).
	[Settings]
	CH1 : 1 V/div. DC mode, 20 nS/div.
	CH2 : 1 V/div. DC mode
• Disc	None needed
• Player state	Test mode, recording power ON
• Adjustment location	**VR3502 (EFM DLY) (STRATEGY BOARD assy)**

[Procedures]

(1) Disconnect a connector CN3502.
(2) Turn VR104 (REC. PW) fully counterclockwise to reduce the power to minimum.
(3) Press RECORD and REC MUTE keys in the order to lights up the laser diode.
(4) Adjust the time from rising edge of CN3506 pin 5 to rising edge of pin 4 of waveform at the 2V level.
(5) Adjust VR3502 (EFM DLY) so that the delay becomes 80nS ± 3nS.

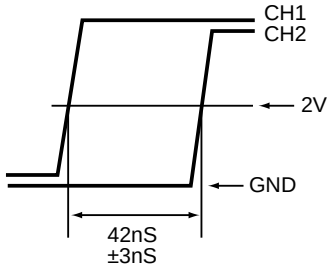


4.3.4 3T Rising Edge Time Adjustment

• Objective	Pulse adjustment for recording (3)
• Symptom when out of adjustment	The unit does not playback CD-R discs which was recorded with this player .
• Measurement instrument connections	Oscilloscope to **CH1 : CN3506, Pin-3 (3T IN) (STRATEGY BOARD assy)** **CH2 : CN3506, Pin-2 (3T OUT) (STRATEGY BOARD assy)** GND probe can be connected to CN3506, Pin-1 (DGND). [Settings] CH1 : 1 V/div., DC mode, 20 nS/div. CH2 : 1 V/div., DC mode
• Disc	None needed
• Player state	Test mode, recording power ON
• Adjustment location	**VR3503 (3T DLY) (STRATEGY BOARD assy)**

[Procedures]

(1) Disconnect a connector CN3502.
(2) Turn VR104 (REC. PW) fully counterclockwise to reduce the power at minimum.
(3) Press the RECORD and the REC MUTE keys in the order to lights up the laser diode.
(4) Adjust the time from rising edge of CN3506 pin-3 to rising edge of pin 2 of waveform with 2V level.
(5) Adjust VR3503 (3T DLY) so that the delay becomes 42nS ± 3nS.
(6) Connect a connector CN3502.



4.3.5 WBL+ Offset Adjustment

• Objective	To adjust the gain balance of the wobble signal.
• Symptom when out of adjustment	The unit does not record or playback CD-R discs.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-6 (RWBL) (HEAD BOARD assy)** GND probe can be connected to CN104, Pin-4 (AGND). [Settings]: 1 mV/div., 5 mS/div., DC mode
• Disc	None needed
• Player state	Test mode, stop
• Adjustment location	**VR107 (WBL+. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Turn VR108 (WBL. OFS) to fully counterclockwise.
(2) Adjust VR107 (WBL+. OFS) so that the DC voltage at CN104 (TP1), Pin-6 (RWBL) is Ð20mV ± 10mV.

4.3.6 Coarse WBL Offset Adjustment

• Objective	To optimize the DC offset voltage of the wobble amp.
• Symptom when out of adjustment	The unit does not record or playback CD-R discs.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-5 (WBL) (HEAD BOARD assy)**
	GND probe can be connected to CN104, Pin-4 (AGND).
	[Settings]: 1 mV/div., 5 mS/div., DC mode
• Disc	None needed
• Player state	Test mode, stop
• Adjustment location	**VR108 (WBL. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Adjust VR108 (WBL. OFS) so that the DC voltage at Pin 5 (WBL) of CN104 (TP1) becomes 0 ± 10mV.

4.3.7 RF Offset Adjustment

• Objective	To optimize the DC offset voltage of the RF amp.
• Symptom when out of adjustment	The unit does not playback..
• Measurement instrument connections	Oscilloscope to **CN204, Pin-1 (RF) (SERVO UCOM BOARD assy)**
	GND probe can be connected to CN204, Pin-4 (AGND).
	[Settings]: 1 mV/div., 5 mS/div., DC mode
• Disc	None needed
• Player state	Test mode, stop
• Adjustment location	**VR121 (RF. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Adjust VR121 (RF. OFS) so that the DC voltage at Pin 1 (RF) of CN204 (TP201) becomes 0 ± 10mV.

4.3.8 Playback Power Re-adjustment

[Procedures]

(1) Adjust in the same manner as "4.2.1. Playback Power Adjustment " in Adjustment 1.

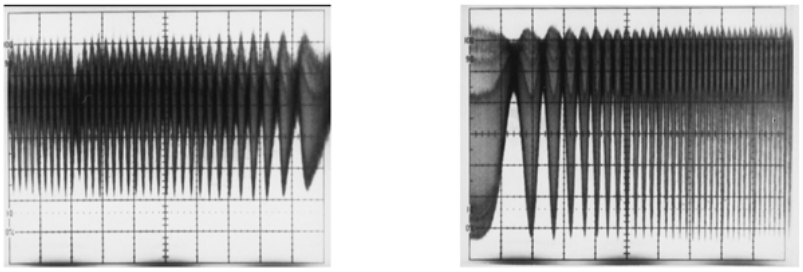
4.3.9 Coarse Focus Offset Adjustment

• Objective	To optimize the DC offset voltage of the focus error amp.
• Symptom when out of adjustment	The unit does not focus in and the RF signal is dirty.
• Measurement instrument connections	Oscilloscope to **CN204, Pin-1 (RF) (SERVO UCOM BOARD assy)** GND probe can be connected to CN204, Pin-4 (AGND). [Settings]: 20 mV/div., 2 mS/div., DC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open
• Adjustment location	**VR105 (FE. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then the spindle servo.

(2) Adjust VR105 (FE. OFS) so that the amplitude of RF signal at CN204, Pin-1 (RF) is maximum.



Out of adjustment　　Optimum adjustment

Fig. 18

4.3.10 Main and Sub Mix Ratio Adjustment

• Objective	To mix the gain of the main signal output and sub signal output of the pickup.
• Symptom when out of adjustment	The unit does not playback.
• Measurement instrument connections	Oscilloscope to **CH1: CN104, Pin-1 (STE) (HEAD BOARD assy)** **CH2: CN104, Pin-2 (MSTE) (HEAD BOARD assy)** [These connections must be via low pass filters.] GND probe can be connected to CN104, Pin-4 (AGND). [Settings] CH1 : 50 mV/div. AC mode 10 mS/div. ADD mode CH2 : 100 mV/diV. AC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open
• Adjustment location	**VR110 (MS. MIX) (HEAD BOARD assy)**

[Procedures]

(1) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then the spindle servo.

(2) Set the oscilloscope to ADD mode (waveform adding mode of CH1 and CH2) and observe the adding waveform of CH1 and CH2.

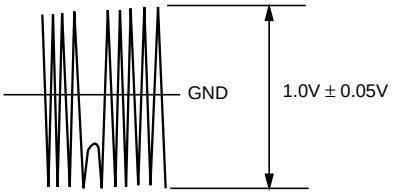
(3) Adjust VR110 (MS. MIX) so that the amplitude of waveform becomes minimum.

4.3.11 Tracking Amp. Gain Adjustment

• Objective	To correct the discrepancy in the tracking error level with the pickup.
• Symptom when out of adjustment	The unit does not playback, track search is impossible, tracks are skipped.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-3 (TE) (HEAD BOARD assy)** [The connection must be via a low pass filter (15k½ + 0.001µF).] GND probe can be connected to CN104, Pin-4 (AGND). [Settings]: 20 mV/div., 5 mS/div.DC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open
• Adjustment location	**VR111 (TE. GAIN) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.
(2) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then the spindle servo.
(3) Line up the bright line (ground) at the center of the oscilloscope screen and put the oscilloscope into DC mode.
(4) Adjust VR111 (TE. GAIN) so that the positive amplitude and negative amplitude of the tracking error signal at CN104 (TP1), Pin 3 (TE) is 1.0V ± 0.05V.



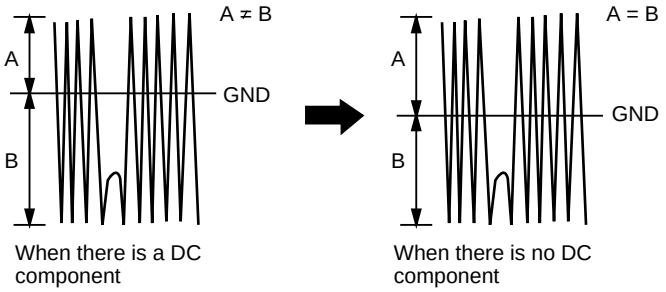
4.3.12 Tracking Offset Adjustment

• Objective	To correct for the variation in the sensitivity of the tracking photodiode.
• Symptom when out of adjustment	The unit does not playback, track search is impossible, tracks are skipped.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-3 (TE) (HEAD BOARD assy)** [This connection must be via a low pass filter (15k½ + 0.001µF).] GND probe can be connected to CN104, Pin-4 (AGND). [Settings]: 20 mV/div., 5 mS/div., DC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open
• Adjustment location	**VR112 (TE. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.
(2) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then the spindle servo.
(3) Line up the bright line (ground) at the center of the oscilloscope screen and put the oscilloscope into DC mode.
(4) Adjust VR112 (TE. OFS) so that the positive amplitude and negative amplitude of the tracking error signal at CN104, Pin-3 (TE) are the same (in other words, so that there is no DC component).

Note : If the great offset is observed, perform the adjustments in the section 4.3.11 and 4.3.12.



4.3.13 ACT Offset Adjustment

• Objective	To optimize the DC offset voltage of the actuator servo.
• Symptom when out of adjustment	The unit does not pause, track search is impossible, tracks are skipped.
• Measurement instrument connections	Oscilloscope to **CN5021, Pin-1 (ACT ERR) (SERVO UCOM BOARD assy)**
	[Settings]: 5 mV/div, 5 mS/div., DC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open
• Adjustment location	**VR1 (ACT. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.
(2) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then the spindle servo.
(3) Adjust VR1 (ACT. OFS) so that the DC voltage at CN5021 (TP00), Pin 1 (ACT ERR) is 0 ± 20mV.

4.3.14 ACT Gain Adjustment

• Objective	To optimize the actuator servo gain.
• Symptom when out of adjustment	The unit does not pause, track search is impossible, tracks are skipped.
• Measurement instrument connections	Oscilloscope to CN5021, Pin-1 (ACT ERR) (SERVO UCOM BOARD assy)
	[Settings]: 10 mV/div., 5 mS/div., DC mode
• Disc	TCD-785
• Player state	Test mode, focus and spindle servos: closed, tracking servo: open
• Adjustment location	VR10 (ACT. GAIN) (HEAD BOARD assy)

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.
(2) Press the FINALIZE key and the PLAY key in the order to close the focus servo and then the spindle servo.
(3) Press the WRITE key to light up the WRITE KEY LED, and short-circuit the Pin-2 and Pin-3 of CN5021.
Adjust VR10 (ACT. GAIN) so that the DC voltage at CN5021 (TP00), Pin 1 (ACT ERR) is Ð380 ± 20mV.

Note : If the great offset is observed, perform the adjustments in the section 4.3.13 and 4.3.142.

4.3.15 Fine Focus Offset Adjustment

• Objective	To optimize the DC offset voltage of the focus servo circuit.
• Symptom when out of adjustment	The unit does not focus in, sound is cracking and the RF signal is dirty.
• Measurement instrument connections	Oscilloscope to **CN204, Pin-1 (RF) (SERVO UCOM BOARD assy)** GND probe can be connected to CN204, Pin-4 (AGND). [Settings]: 20 mV/div., 500 nS/div., AC mode
• Disc	STD-R03
• Player state	Test mode, play
• Adjustment location	**VR105 (FE. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.

(2) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the player into play mode.

(3) Adjust VR105 (FE. OFS) so that the 3T waveform at CN204, Pin-1 (RF) is maximum.

Note : Adjust after confirming that the WRITE KEY LED is OFF.

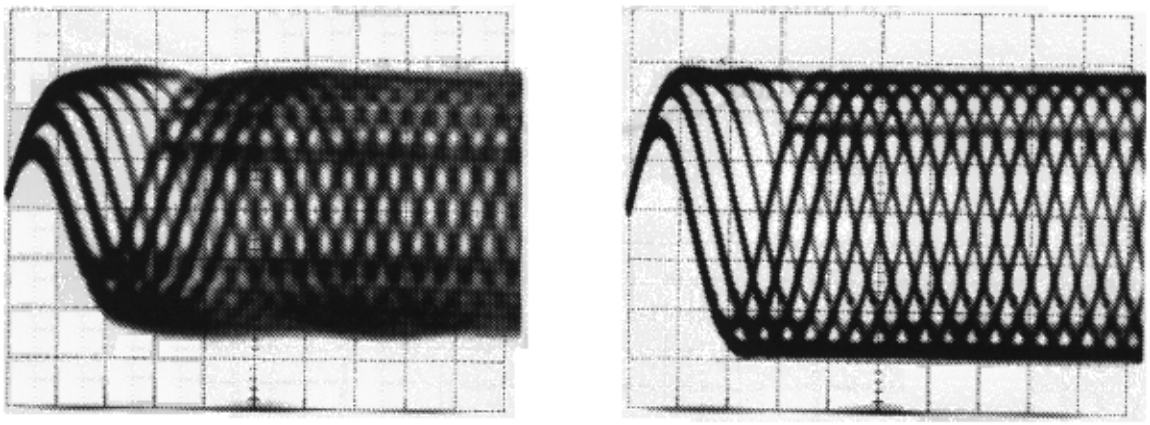


Fig. 19

4.3.16 WBL Balance Adjustment

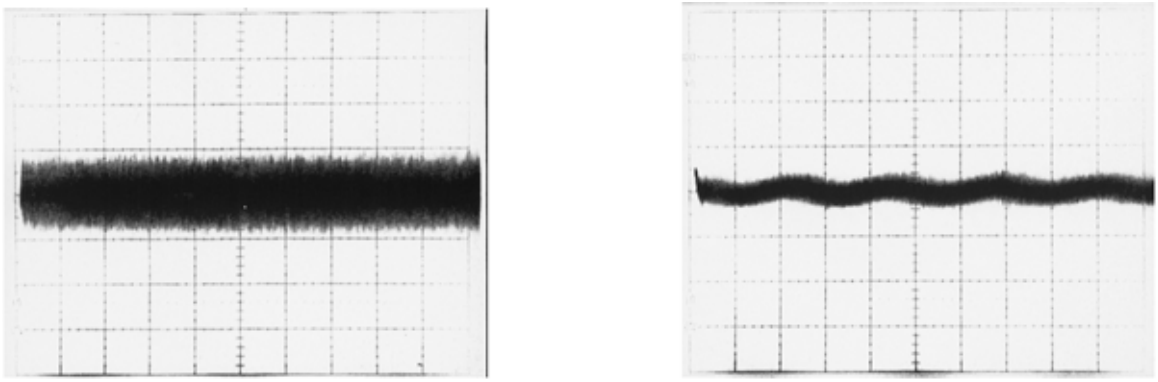
• Objective	To adjust the gain balance of the wobble signal.
• Symptom when out of adjustment	The unit does not record or search or pause CD-R discs.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-5 (WBL) (HEAD BOARD assy)** [This connection must be via high-pass filter (180pF+3.9kΩ).] GND probe can be connected to CN104, Pin-4 (AGND). [Settings]: 5 mV/div., 20 μS/div., DC mode
• Disc	STD-R03
• Player state	Test mode, play
• Adjustment location	**VR106 (WBL. BALANCE) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.

(2) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the player into play mode.

(3) Adjust VR106 (WBL. BALANCE) so that the amplitude of waveform at CN104 (TP1), Pin 5 (WBL) is minimum.



Out of adjustment　　Optimum adjustment

Fig. 20

4.3.17 Fine WBL Offset Adjustment

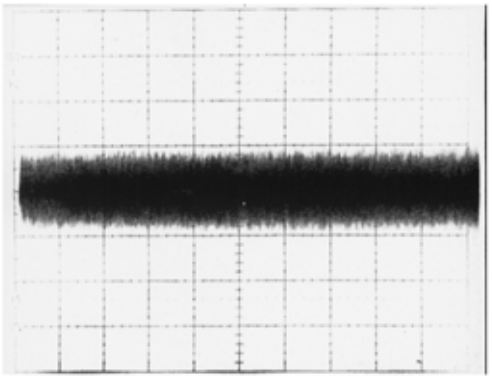
• Objective	To adjust the gain balance of the wobble signal.
• Symptom when out of adjustment	The unit does not record, search or pause CD-R discs.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-5 (WBL) (HEAD BOARD assy)**
	[This connection must be via high-pass filter (180pF+3.9kΩ).]
	GND probe can be connected to CN104, Pin-4 (AGND).
	[Settings]: 5 mV/div., 20 μS/div., DC mode
• Disc	STD-R03
• Player state	Test mode, play
• Adjustment location	**VR108 (WBL. OFS) (HEAD BOARD assy)**

[Procedures]

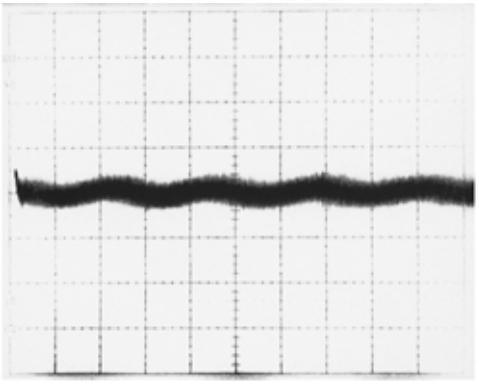
(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.

(2) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the player into play mode.

(3) Adjust VR108 (WBL. OFS) so that the amplitude of waveform at CN104, Pin-5 (WBL) is minimum.



Out of adjustment



Optimum adjustment

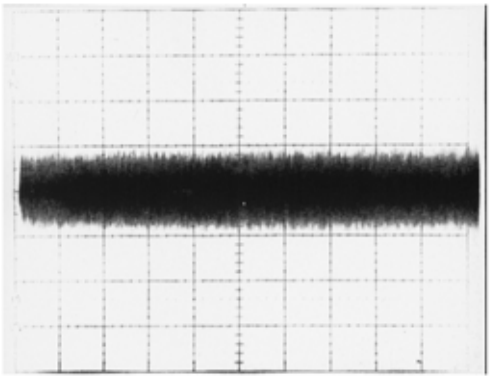
Fig. 21

4.3.18 WBL Focus Offset Adjustment

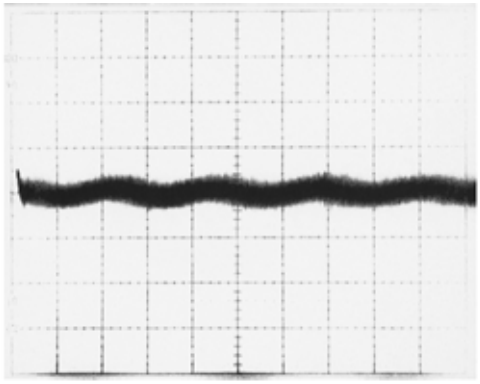
• Objective	To adjust the gain balance of the wobble signal.
• Symptom when out of adjustment	The unit does not record, search or pause CD-R discs.
• Measurement instrument connections	Oscilloscope to **CN104, Pin-5 (WBL) (HEAD BOARD assy)** [This connection must be via high-pass filter (180pF+3.9k½).] GND probe can be connected to CN104, Pin-4 (AGND). [Settings]: 5 mV/div., 20 mS/div., DC mode
• Disc	STD-R03
• Player state	Test mode, play
• Adjustment location	**VR115 (WFE. OFS) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.
(2) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the CR200 into play mode.
(3) Press the AUTO/MANUAL key to light up the COPY BIT LED.
(4) Adjust VR115 (WFE. OFS) so that the amplitude of waveform at CN104, Pin-5 (WBL) is minimum.



Out of adjustment



Optimum adjustment

Fig. 22

4.3.19 Recording Power Adjustment

DANGER - LASER RADIATION WHEN OPEN.
AVOID DIRECT EXPOSURE TO BEAM.

• Objective	To optimize the recording power of the laser diode.
• Symptom when out of adjustment	The unit does not either record or playback self-recorded discs. It also skips tracks and the RF waveform is dirty. (No problem shown during CD playback)
• Measurement instrument connections	Multimeter to **CN104, Pin-7 (PWAJT) (HEAD BOARD assy)** GND probe can be connected to CN104, Pin-4 (AGND).
• Disc	None needed
• Player state	Test mode, maximum recording power ON
• Adjustment location	**VR104 (REC. PW) (HEAD BOARD assy)**

CAUTION:

(a) Perform this adjustment more than 5 minutes after starting up the test mode.
(b) Power more than ten times greater than playback power is released during these adjustment. Never look directly at the objective lens.
(c) This adjustment cannot be performed accurately if disc is inserted. Be sure to remove disc first before adjustments.
(d) The laser diode may be damaged if the recording power is greater than the specified value. Always perform the step 1 below before making adjustments and be careful not to exceed the adjustment value by more than 50mV from the specified value in the step 3 below).

[Procedures]

• When Adjusting with the multimeter

(1) Fully turn VR104 (REC. PW) counterclockwise to reduce the power to the minimum.
(2) Press RECORD and REC MUTE keys in this order to lights up the laser diode.
(3) Adjust the voltage value of Pin 7 (PWAJT) of CN104 to the voltage value (REC. PW voltage ± 10mV) displayed on the pickup flexible cable using VR104 (REC. PW).

• Reference: When adjusting with optical power meter

CAUTION:

(a) Perform this adjustment more than two minutes after starting up the test mode (after inserting the AC plug).
(b) The laser diode may be damaged if the recording power is greater than the specified value. Always perform step 1 before making adjustments and be careful not to exceed the adjustment value by more than 0.3mW (specified value in step 3).
(c) Power more than ten times greater than playback power is released during this adjustment. Never look directly at the objective lens.

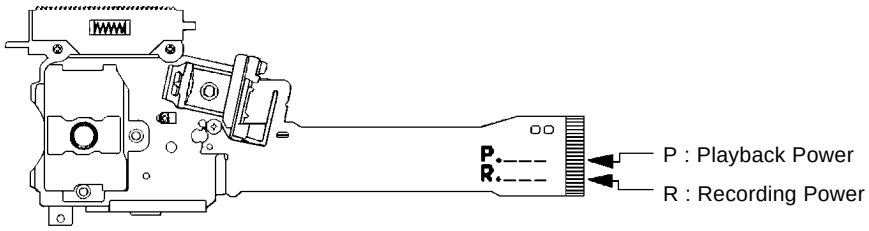
[Procedures]

(1) Fully turn VR104 (REC. PW) counterclockwise to reduce the power to the minimum.

(2) Move the pickup to the outer edge of the disc with the MANUAL / TRACK SEARCH FWD key.

(3) Press RECORD and REC MUTE keys in that order to lights up the laser diode.

(4) Shine the light discharged from the objective lens in the pickup on the light power meter sensor and adjust VR104 (REC. PW) so that the recording laser diode output is an average of 4.7mW ± 0.1mW (Wavelength 790nm, Average mode).



4.3.20 HF Amp. Gain Adjustment

• Objective	To correct the discrepancy in the HF level with the pickup.
• Symptom when out of adjustment	The unit does not record, track search is impossible.
• Measurement instrument connections	Oscilloscope to **CN104, Pin 8 (HF) (HEAD BOARD assy)**
	GND probe can be connected to CN104, Pin-4 (AGND).
	[Settings]: 50 mV/div., 500 nS/div., DC mode
• Disc	TCD-785
• Player state	Test mode, play
• Adjustment location	**VR119 (HF. GAIN) (HEAD BOARD assy)**

[Procedures]

(1) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.

(2) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the player into play mode.

(3) Line up bright line (ground) at the center of the oscilloscope screen and put the oscilloscope into DC mode.

(4) Adjust VR119 (HF. GAIN) so that the amplitude of waveform at CN104 , Pin-8 (HF) is 2.0V ± 0.1V.

NOTE :

Adjust after checking that the COPY BIT LED is OFF.

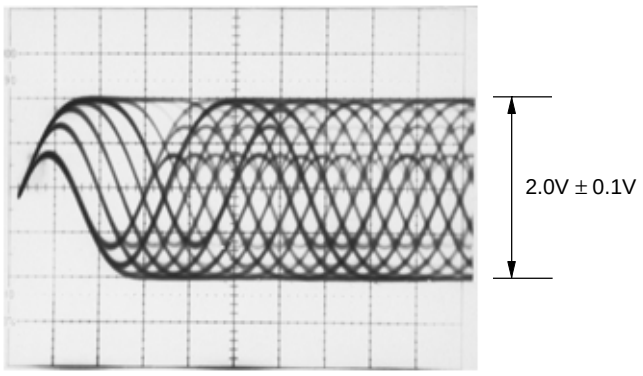


Fig. 23

4.3.21 Focus Servo Loop Gain Adjustment

• Objective	To optimize the focus servo loop gain.
• Symptom when out of adjustment	Playback does not start or focus acutuator noisy.
• Measurement instrument connections	Oscilliscope CH1 to **CN204, Pin-5 (FCSIN)** via 100k½ resistor Oscilloscope CH2 to **CN204, Pin-6 (FCSER)** **(SERVO UCOM BOARD assy)** See Fig.23 below. [Settings] CH1 : 0.1 V/div., X-Y mode CH2 : 10 mV/div. GND probe can be connected to CN204, Pin-4 (AGND).
• Disc	TCD-785
• Player state	Test mode, play
• Adjustment location	**VR201 (FCS. GAIN) (SERVO UCOM BOARD assy)**

[Procedures]

(1) Set the AF generator output to 1.4kHz and 1Vp-p.
(2) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.
(3) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the player into play mode.
(4) Adjust VR201 (FCS. GAIN) so that the lissajous waveform is symmetrical about X axis and the Y axis.

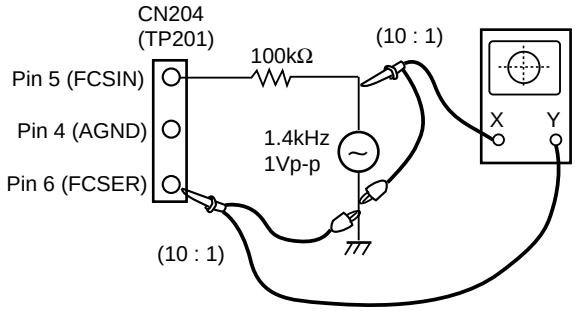
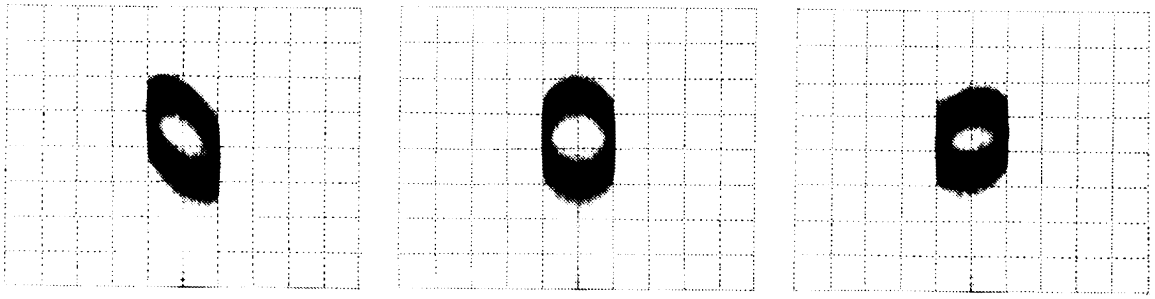


Fig. 24



Higher gain Optimum gain Lower gain

4.3.22 Tracking Servo Loop Gain Adjustment

• Objective	To optimize the tracking servo loop gain.
• Symptom when out of adjustment	The unit does not start, during searches the acutuator is noisy, or tracks are skipped.
• Measurement instrument connections	Oscilliscope CH1 to **CN204, Pin-3 (TRKIN)** via 100k½ resistor Oscilloscope CH2 to **CN204, Pin-2 (TRKER)** **(SERVO UCOM BOARD assy)** See Fig.24 below. [Settings] CH1 : 0.1 V/div., X-Y mode CH2 : 10 mV/div. GND probe can be connected to CN204, Pin-4 (AGND).
• Disc	TCD-785
• Player state	Test mode, play
• Adjustment location	**VR202 (TE. GAIN) (SERVO UCOM BOARD assy)**

[Procedures]

(1) Set the AF generator output to 1.2kHz and 2Vp-p.

(2) Move the pickup to midway across the disc (R = 35mm) with the MANUAL / TRACK SEARCH FWD or REV keys.

(3) Press the FINALIZE key, the PLAY key and the PAUSE key in the order to close the respective servos and put the player into play mode.

(4) Adjust VR202 (TE. GAIN) so that the lissajous waveform is symmetrical about X axis and the Y axis.

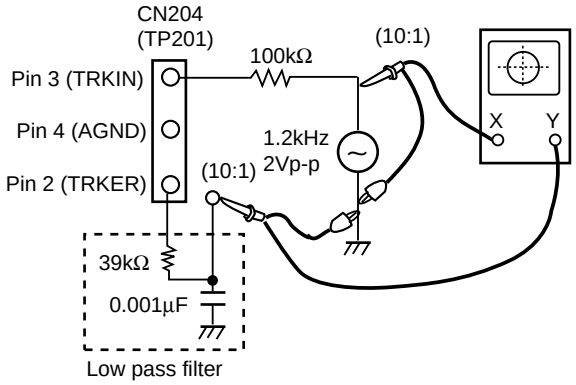
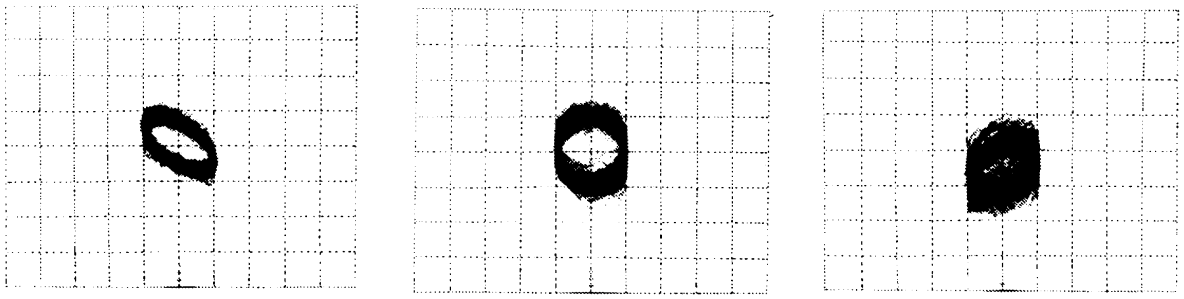


Fig. 25



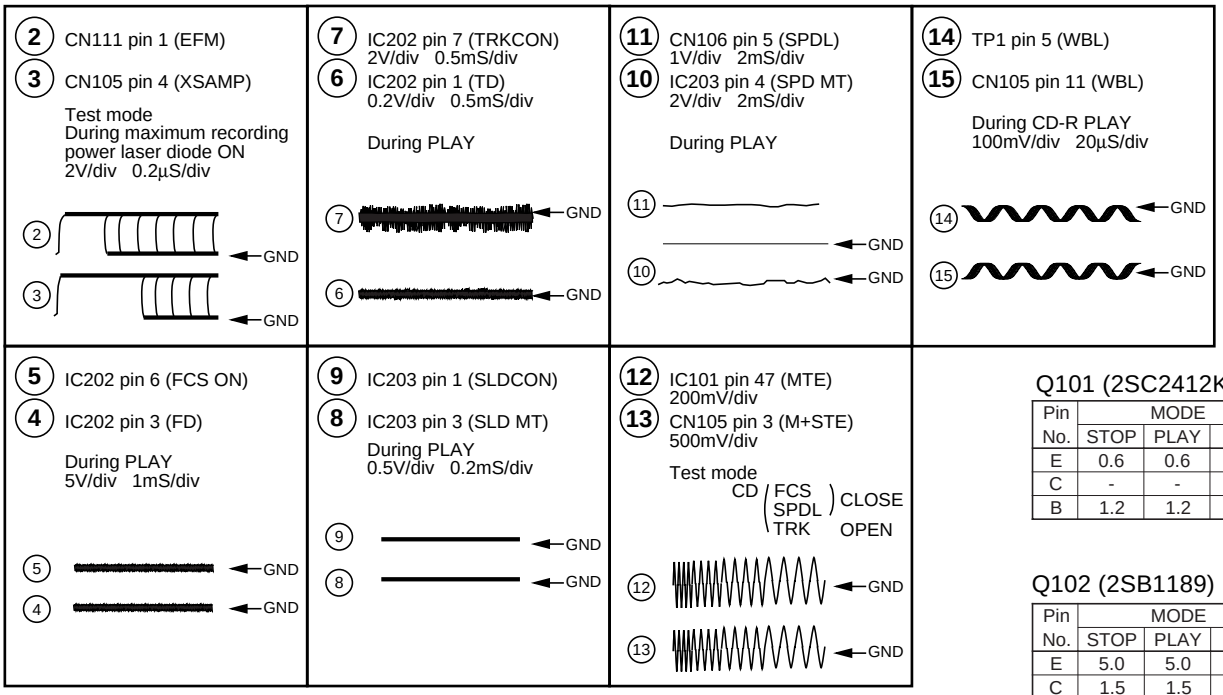
Higher gain Optimum gain Lower gain

5. ADDITIONAL INFORMATION

5-1. WAVEFORM AND VOLTAGES

● HEAD BOARD ASSY

• Measuring condition: DC input unless otherwise noted.



IC101 (PA4022A) [V]

Pin No.	MODE			Pin No.	MODE		
	STOP	PLAY	REC		STOP	PLAY	REC
1	0.01	-	-0.1	35	0.6	0.6	0.8
2	0.02	-0.12	-0.4	36	0.6	0.6	0.8
3	0	-0.16	0	37	1.2	1.2	1.5
4	-4.9	-4.9	-4.9	38	0.1	0.1	3.1
5	0	0	0	39	5.0	0	0
6	0	0	0	40	0	0	-0.1
7	0	0	0	41	0	0	0
8	0	0	0	42	0	0	0
9	0	0	0	43	0	0	0.1
10	0	0	0	44	0	-0.1	-0.1
11	0	0	0	45	-4.9	-4.9	-4.9
12	0	0	0	46	0	-0.1	-0.1
13	0	0	0	47	0	0	0
14	0	0	0	48	0	0	0
15	0	0	0	49	0	0	0
16	0	0	-	50	0	0	0
17	0	0	0	51	0	0	0
18	0	0	0	52	0	-0.1	0
19	0	0	0	53	0	-0.1	-0.1
20	0	0	0	54	0	0.2	0.2
21	0	0	0	55	0	0	0
22	0	0	0	56	0	0	0
23	1.4	1.4	1.4	57	0.1	0.1	0.1
24	1.4	1.4	1.4	58	-4.0	-4.0	-4.0
25	0	0	0.9	59	-2.9	-2.7	-2.7
26	0	0.2	0.2	60	0	0	0
27	0	0	1.2	61	0	0	0
28	0	0	0	62	0	0	0
29	5.0	5.0	5.0	63	5.0	5.0	5.0
30	4.2	1.2	1.2	64	-0.1	0.3	0.3
31	-3.4	-1.7	-1.7	65	0	-0.1	0
32	0	0	0	66	-0.3	1.4	1.2
33	-1.0	0	0	67	0	0	0
34	4.3	3.6	3.6	68	-0.1	0	0

IC102 (BA4560F) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0	0.2	1.5
2	1.4	1.4	1.5
3	4.4	1.4	1.4
4	-5.0	-5.0	-5.0
5	0	0	0
6	0	0	0
7	0	0	0.1 to 0.6
8	5	5	5

IC103 (TC7S08F) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0	0	0
2	0	0	2.0
3	0	-	-
4	0	0	2.0
5	5	-	-

IC104 (BA4560F) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0	-0.1	-0.2
2	0	-0.1	-0.1
3	0	-0.1	-0.1
4	-5.0	-	-
5	0	0	0
6	0	0	0
7	0	0	0
8	5.0	-	-

IC202 (LA6517) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0	0	0
2	9.4	-	-
3	-0.4	-0.4	-0.4
4	-10.0	-	-
5	-0.4	-0.4	-0.4
6	-0.4	-0.4	-0.4
7	0	0	0
8	0	0	0

IC203 (LA6520) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0.01	0.01	0 to 0.2
2	0.01	0.3	0.1 to 0.4
3	0	0.3	0.2 to 0.3
4	0.04	-0.1	-0.5 to -0.7
5	2.2	2.2	2.2
6	2.2	2.2	2.2
7	0	0	0
8	0	0	0
9	0	0	0
10	-	-	-
11	-	-	-
12	9.4	-	-
	-10.0	-	-

Q101 (2SC2412K) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	0.6	0.6	0.8
C	-	-	-
B	1.2	1.2	1.4

Q102 (2SB1189) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	4.5
C	1.5	1.5	1.8
B	4.3	3.8	3.8

Q103~5 (2SA1037K) [V]

1Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	4.8
C	1.0	1.0	2.2
B	-	-	-

Q106 (2SA1037K) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	4.8
C	-	-	-
B	-	-	-

Q107 (2SA1461) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	-	-	-
C	1.5	1.5	1.8
B	3.0	3.0	3.0

Q109 (DTC114TS) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	0	-	-
C	0	1.1	1.2
B	5.0	0	0

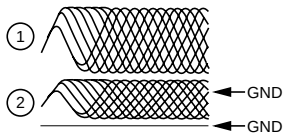
Q111 (DTA114TK) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	-	-
C	0	0	4.4
B	5.0	0	0

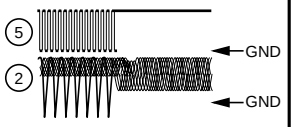
● SERVO UCOM BOARD ASSY

• Measuring condition: DC input unless otherwise noted.

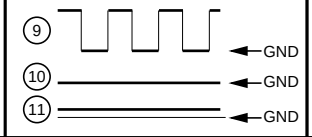
1 J201 pin 10 (HF)
2 CN204 pin 1 (RF)
During CD PLAY
500mV/div 0.5µS/div



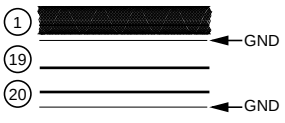
5 IC205 pin 63 (MIRR) 2V/div
2 CN204 pin 1 (RF) 0.5V/div
During manual search
0.5mS/div



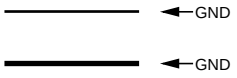
9 IC356 pin 48 (SPSP) 2V/div
10 IC205 pin 13 (CLV) 10V/div
11 IC205 pin 14 (ECLV) 10V/div
In the test mode (FCS ON, SPDL ON (CD), TRK OPEN)
20µS/div



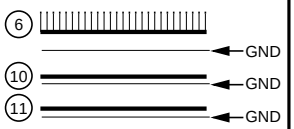
1 J201 pin 10 (HF)
19 IC356 pin 23 (RFT)
20 IC356 pin 24 (RFB)
During CD-R PLAY
(in common with GND of 1 and 19)
1V/div 1mS/div



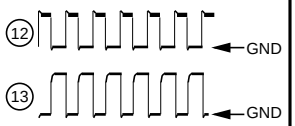
3 CN204 pin 2 (TE)
Test mode
TRK, CLOSE state
Top : FILTER exist
Bottom : FILTER none
500mV/div 0.5mS/div



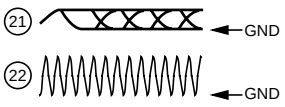
6 IC206 pin 4 (MDP) 2V/div
10 IC205 pin 13 (CLV) 10V/div
11 IC205 pin 14 (ECLV) 10V/div
During CD PLAY
20µS/div



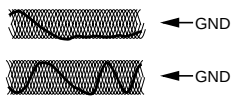
12 IC205 pin 19 (FGIN)
13 IC205 pin 17 (FGOUT)
In the test mode (FCS ON, SPDL ON (CD), TRK OPEN)
2V/div 2mS/div



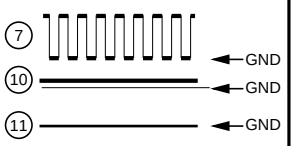
21 J209 pin 5 (DOUT) 5V/div
22 J208 pin 13 (MCK) 2V/div
During CD PLAY
0.1µS/div



3 CN204 pin 2 (TE)
Test mode (FSC, SPDL ON TRK, OPEN state)
Top : FILTER exist
Bottom : FILTER none
500mV/div 0.5mS/div



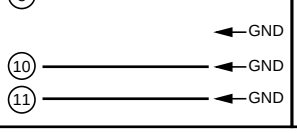
7 IC207 pin 4 (MDP) 2V/div
10 IC205 pin 13 (CLV) 10V/div
11 IC205 pin 14 (ECLV) 10V/div
During CD-R REC
20µS/div



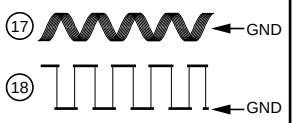
14 IC206 pin 34 (DATA)
15 IC206 pin 32 (LRCK)
16 IC206 pin 35 (BCLK)
During CD PLAY (1kHz 0dB)
10V/div 2µS/div

4 CN204 pin 6 (FE)
Test mode
TRK, CLOSE state
0.5V/div 2mS/div

8 IC205 pin 9 (SPDLO) 1V/div
10 IC205 pin 13 (CLV) 10V/div
11 IC205 pin 14 (ECLV) 10V/div
During STOP
20µS/div



17 J201 pin 11 (WBL) 50mV/div
18 IC207 pin 1 (WBL) 2V/div
During CD-R PLAY
20µS/div



IC208 (LM2940CT-5.0) [V]

Pin No.	MODE		
	STOP	PLAY	REC
U	9.3	-	-
G	0	-	-
+5	5.0	-	-

IC311 (PST529C) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	5.0	5.0	5.0
2	0	0	0
3	5.0	5.0	5.0

IC204 (HD74HC4053FP) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0	0	0
2	0	0	0
3	0.9	1.5	1.9
4	0.9	0.1	9
5	0.1	0.1	1.3
6	0	0	0
7	0	0	0
8	0	0	0
9	5.0	0	5.0
10	0	0	0
11	0	4.9	0.2
12	5.0	5.0	5.0
13	0	5.0	5.0
14	5.0	5.0	5.0
15	0	0	0
16	5.0	5.0	5.0

IC201 (CXA1372Q) [V]

Pin No.	MODE			Pin No.	MODE			Pin No.	MODE		
	STOP	PLAY	REC		STOP	PLAY	REC		STOP	PLAY	REC
1	0	0	0	17	1.3	1.3	1.3	33	0.1	5.0	5.0
2	0	0	0	18	0	0	0	34	1.4	-1.1	-4.8
3	0	0	0	19	-4.0	-4.9	-4.9	35	-1.0	-1.4	-4.8
4	0	0	0	20	5.0	5.0	5.0	36	5.0	5.0	5.0
5	-0.4	-0.4	-0.4	21	5.0	5.0	5.0	37	0	-0.4	-4.0
6	0	0	0	22	4.8	4.9	5.0	38	-4.0	-3.2	-1.9
7	0.3	0.3	0.3	23	5.0	5.0	5.0	39	0	0	0
8	0	0	0	24	0.7	0.7	0.7	40	-0.1	0.1	3.9
9	0	0	0	25	4.9	4.9	0	41	-4.9	-4.9	-4.9
10	5.0	5.0	5.0	26	0.1	0.1	1.2	42	0	0	0
11	0	0	0	27	0.8	1.5	1.9	43	0	0	0
12	0	0	0	28	0	0	0	44	0	0	0
13	0	0	0	29	0	0	3.7	45	0	0	0
14	0	0.3	0.3	30	-4.9	-4.9	-4.9	46	0	0	0
15	0	0	0	31	2.5	2.5	2.5	47	0.2	0	0
16	-4.0	-4.0	-4.0	32	2.6	2.6	2.8	48	0.2	0	0

IC205 (PA9004A) [V]

Pin	MODE			Pin	MODE		
No.	STOP	PLAY	REC	No.	STOP	PLAY	REC
1	5.0	5.0	5.0	33	3.9	3.9	3.9
2	2.5	2.4	2.5	34	0	0	0
3	3.1	3.1	2.5	35	0.6	0.6	0.6
4	0.8	0.8	2.3	36	0.1	0.1	0.1
5	0.8	0.8	2.3	37	0	0	0
6	2.5	2.5	2.5	38	0	0	0
7	2.5	2.4	1.8	39	0	0	0
8	2.5	2.5	2.5	40	0	0	0
9	2.4	2.6	2.6	41	0	0	0
10	2.5	2.5	2.5	42	0	0	0
11	0	0	0	43	0	0	0
12	2.4	2.4	2.4	44	0	0	0
13	0	4.9	4.9	45	5.0	2.4	2.4
14	0	4.9	0	46	0	0	0
15	2.5	2.5	2.6	47	1.6	0.9	1.2
16	0	0	0	48	1.6	2.6	1.2
17	5.0	2.8	2.8	49	1.6	2.6	1.9
18	-4.0	-4.0	-4.0	50	1.6	2.6	1.9
19	0	3.3	3.3	51	1.6	1.6	1.6
20	0	0	0	52	-0.3	1.4	1.8
21	0	0	0	53	-4.0	-4.0	-4.0
22	0	0	5.0	54	0.3	1.4	2.3
23	0	0	5.0	55	-1.0	1.5	1.3
24	0	0	0	56	-0.3	1.9	1.9
25	1.0	1.0	1.4	57	0	0	0
26	5.0	5.0	5.0	58	-0.8	-0.6	-0.8
27	0	5.0	0	59	0	0.9	0.3
28	0	0	0	60	0.4	0.4	0.4
29	0	0	0	61	5.0	0	5.0
30	0	0	0	62	1.7	0.4	1.7
31	0	0	0	63	5.0	5.0	2.8
32	0	0	0	64	3.9	3.9	3.9

IC207 (PDJ006A) [V]

Pin	MODE			Pin	MODE		
No.	STOP	PLAY	REC	No.	STOP	PLAY	REC
1	0.1	2.3	2.1	41	4.9	5.0	4.9
2	5.0	0	2.8	42	5.0	5.0	5.0
3	0.1	0	0.1	43	5.0	5.0	5.0
4	5.0	5.0	2.5	44	5.0	5.0	5.0
5	0	0	0	45	0	0	0
6	0.3	0	0.2	46	0	0	0
7	0	0	0	47	0	0	0
8	0	0	0	48	0	0	0
9	5.0	5.0	5.0	49	0	0	0
10	0.1	0.1	0.2	50	0	0	0
11	5.0	5.0	5.0	51	0	0	0
12	5.0	5.0	5.0	52	0	0	0
13	2.4	0	2.4	53	0	0	0
14	4.9	4.9	4.9	54	0	0	0
15	0	0	5.0	55	0	0	0
16	0	0	5.0	56	0	0	0
17	0	5.0	5.0	57	0	0	0
18	5.0	5.0	5.0	58	5.0	5.0	5.0
19	0.1	0.1	0.4	59	1.9	1.6	2.5
20	4.9	4.9	-	60	5.0	5.0	5.0
21	4.9	4.9	4.9	61	0	0	0
22	4.9	4.9	4.9	62	0	0	0
23	1.6	0.9	1.3	63	0	5.0	5.0
24	3.3	2.4	2.2	64	0	5.0	0
25	3.6	3.3	2.2	65	5.0	0	0
26	4.1	3.2	3.5	66	5.0	5.0	5.0
27	1.1	0.9	1.1	67	5.0	5.0	5.0
28	0	0	0	68	0	0	0
29	1.4	1.0	1.7	69	5.0	0	5.0
30	0.5	0.7	0.8	70	5.0	0	0
31	4.7	4.7	4.7	71	0	5.0	5.0
32	2.8	3.4	3.1	72	0	0	0
33	3.0	3.1	3.3	73	0	0	0
34	3.2	3.2	2.8	74	0	0	0
35	3.2	3.4	2.9	75	0	0	0
36	1.8	1.8	2.5	76	0	0	0
37	3.4	3.2	3.4	77	0	0	0
38	5.0	5.0	5.0	78	5.0	5.0	5.0
39	1.2	1.4	1.3	79	0	0	0
40	2.9	2.6	3.3	80	0	0	0

IC206 (CXD2500BQ) [V]

Pin	MODE			Pin	MODE		
No.	STOP	PLAY	REC	No.	STOP	PLAY	REC
1	0.1	4.9	4.8	41	1.1	1.1	1.1
2	0	0.2	0.6	42	0	5.0	5.0
3	0	5.0	5.0	43	2.5	2.5	2.5
4	2.4	2.5	3.8	44	5.0	0	0
5	0.1	0.2	0.6	45	0	5.0	5
6	0	5.0	5.0	46	4.3	4.4	4.4
7	0.1	0.2	0.6	47	3.3	0	0
8	5.0	5.0	5.0	48	3.3	0	0
9	0	0	0	49	0	0	0
10	0	0	0	50	1.2	1.2	1.2
11	0.1	0.2	0.6	51	1.2	1.2	1.2
12	0	0	0	52	0	0	0
13	0.1	0.2	0.6	53	2.1	2.1	2.1
14	0.1	0.2	0.6	54	2.8	2.7	2.7
15	0.1	0.2	0.3	55	0	0	0
16	5.0	5.0	5.0	56	2.8	2.7	2.7
17	0	0	0	57	1.0	1.0	1.0
18	2.6	2.6	2.6	58	2.1	2.1	2.1
19	2.5	2.5	2.5	59	5.0	5.0	5.0
20	2.5	2.5	2.5	60	2.1	2.1	2.1
21	0	0	0	61	0	0	0
22	2.6	2.6	2.6	62	2.5	2.5	2.5
23	5.0	5.0	5.0	63	0	0.1	0.1
24	2.6	2.6	2.8	64	1.5	0.1	0.1
25	0	0.1	0.4	65	0	0	0
26	0	0	0	66	0	4.6	4.7
27	2.5	2.5	2.5	67	4.9	4.9	4.9
28	0	0	0	68	0	0	0
29	0	0.1	0.4	69	0.1	2.7	2.8
30	0	0	0	70	4.9	4.9	4.9
31	2.5	2.5	2.5	71	0.7	0.6	0.7
32	0	0.1	2.5	72	4.9	4.9	4.9
33	5.0	5.0	5.0	73	5.0	5.0	5.0
34	0	1.2	0	74	4.8	4.9	4.9
35	1.9	1.9	1.9	75	0.9	1.4	1.7
36	0	1.2	0	76	0.8	0.1	1.7
37	1.9	1.9	1.9	77	0.7	0.6	0.7
38	2.5	2.5	2.5	78	5.0	5.0	5.0
39	5.0	0	0	79	4.8	4.9	4.9
40	5.0	5.0	5.0	80	0.9	0.1	1.8

IC352 (LC3517BML-15) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	2.8	2.7	2.7
2	0.7	1.4	1.1
3	3.8	3.3	3.7
4	2.7	2.0	2.5
5	4.0	3.4	3.7
6	3.6	3.0	2.6
7	3.2	2.5	2.6
8	1.5	0.9	1.1
9	2.7	3.3	3.1
10	3.0	3.1	3.3
11	3.2	3.1	3.0
12	0	0	0
13	3.3	3.4	3.2
14	1.8	1.8	2.0
15	3.4	3.3	3.4
16	1.2	1.5	1.4
17	2.9	2.7	2.8
18	4.5	4.5	4.5
19	0.9	0.8	1.1
20	4.9	4.9	4.9
21	4.9	4.9	4.9
22	2.7	2.5	2.5
23	2.8	2.8	2.9
24	4.6	4.6	4.5

IC353 (HD74HC573FP) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	0	0	0
2	2.7	3.4	3.1
3	3.0	3.2	3.4
4	3.2	3.2	3.0
5	3.2	3.3	3.2
6	1.9	1.8	2.1
7	3.5	3.1	3.3
8	1.2	1.4	1.4
9	2.8	2.7	2.7
10	0	0	0
11	0.1	0.1	0.1
12	2.8	2.7	3.0
13	0.8	1.6	1.0
14	3.9	3.5	3.7
15	0.3	1.9	2.9
16	4.1	3.0	3.4
17	3.6	3.2	2.2
18	3.2	2.3	2.2
19	1.5	0.9	1.4
20	5.0	5.0	5.0

IC354 (TC7S00F) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	0	0	0
2	4.9	4.9	4.9
3	0	0	0
4	4.5	4.5	4.5
5	4.5	4.5	4.5

IC361 (PST572E) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	5.0	5.0	5.0
2	0	0	0
3	4.9	5.0	5.0

IC355 (TC7S04F) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	0	0	0
2	4.9	5.0	5.0
3	0	0	0
4	0	0	0
5	5.0	5.0	5.0

IC362 (TC7S04F) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	0.2	0	0.1
2	5.0	0	5.0
3	0	0	0
4	0	5.0	0
5	5.0	5.0	5.0

IC5008 (BA4560F) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	0	-0.2	-0.5
2	0	0	0
3	0	0	0
4	-5.0	-5.0	-5.0
5	0	0	0
6	0	0	0
7	0	0.1	-0.3
8	5.0	5.0	5.0

IC360 (XL93LC46AF) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	0	0	0
2	5.0	5.0	5.0
3	0	0	0
4	4.9	4.8	4.8
5	4.3	2.2	2.2
6	4.8	4.7	4.7
7	0	0	0
8	0	0	0

IC363 (TC7S14F) [V]

Pin	MODE		
No.	STOP	PLAY	REC
1	0.2	0	0.1
2	0	5.0	0
3	0	0	0
4	5.0	0	5.0
5	5.0	5.0	5.0

IC351 (PD4760A9) [V]

Pin No.	MODE			Pin No.	MODE		
	STOP	PLAY	REC		STOP	PLAY	REC
1	-22.6	-22.0	-22.0	41	4.8	4.8	4.8
2	0	0	0	42	4.8	4.8	4.8
3	0	0	0	43	0.1	5.0	5.0
4	0	0	-22.0	44	0.1	4.9	0.1
5	-22.6	0	-22.0	45	5.0	0	0.1
6	0	-22.0	-22.0	46	0.08	0	0.1
7	-22.6	-22.0	-22.0	47	0.08	0	0.1
8	5.0	5.0	5.0	48	0.07	0	0.1
9	0.06	5.0	5.0	49	0.07	0	0.1
10	0.06	0	0 or 5	50	4.9	4.9	0
11	0	0	0	51	4.9	4.9	0
12	0	0		52	5.0	5.0	5.0
13	0	0	0	53	4.7	4.7	4.7
14	5.0	0	0	54	4.7	4.7	4.7
15	4.5	0	0	55	4.7	4.7	4.7
16	0.8	0	0	56	-23.6	-23.2	-23.2
17	5.0	0	0	57	-23.6	-23.2	-23.1
18	*1	*1	*1	58	0	0	0
19	0	0	0	59	0	0	0
20	0.08	0	0	60	0	0	0
21	0.08	0	0	61	0	0	0
22	0.05	0	0	62	0	0	0
23	0.05	5.0	5.0	63	0	0	0
24	0	0	0	64	0	5.0	5.0
25	5.0	5.0	5.0	65	-24.6	-24.3	-16.0
26	0.06	5.0	-	66	-13.8	-13.6	-10.9
27	0.06	0	0	67	-21.8	-13.4	-13.3
28	*2	*2	*2	68	-24.5	-24.4	-21.4
29	0.06	0	0.1	69	-24.6	-16.3	-16.2
30	0.06	0	0.1	70	-8.8	-13.3	-13.4
31	0	0	0	71	-25.0	-24.6	-24.7
32	0.07	0	0	72	-12.1	-11.7	(-12 to 14)
33	0.07	0	0.1	73	-12.0	(-14 to 8)	0
34	0.07	0	0.1	74	-9.6	-9.4	0
35	0.06	0	0.1	75	-9.6	-9.4	0
36	0	0	0	76	-12.1	-6.9	-9.3
37	0	0	0	77	-22.4	-22.1	-22.0
38	*3	*3	*3	78	-22.4	-22.1	-22.0
39	*3	*3	*3	79	-22.3	-22.0	-22.0
40	*3	*3	*3	80	-22.4	-22.0	-22.0

IC356 (PD4786A) [V]

Pin No.	MODE			Pin No.	MODE		
	STOP	PLAY	REC		STOP	PLAY	REC
1	3.3	3.4	3.3	38	0.1	5.0	5.0
2	1.9	1.8	2.0	39	4.7	4.8	4.8
3	3.4	3.3	3.4	40	4.3	2.0	2.6
4	1.2	1.6	1.3	41	4.8	4.7	4.7
5	0	0	0.3	42	4.9	4.9	4.8
6	0	0	0.2	43	0	0	0
7	0	0	0.2	44	4.3	4.3	4.2
8	0	0	1.0	45	0	5.0	5.0
9	0	0	0.2	46	0	4.9	0
10	0	0	0.2	47	0	4.9	4.9
11	0	0	1.4	48	2.5	2.6	2.3
12	0	0	0.2	49	0.1	0.1	0.1
13	0.6	0.8	0.9	50	0.1	0.1	4.9
14	0.2	0.3	0.3	51	2.6	-	-
15	5.0	5.0	5.0	52	2.6	-	-
16	0	0	0	53	0	0	0
17	4.9	4.9	4.9	54	0	0	0
18	0	0	0	55	5.0	5.0	5.0
19	0	0	0	56	0.1	4.8	4.8
20	0	0	0	57	0	0	0
21	0	0	0	58	5.0	4.9	4.9
22	0	0.1	0	59			
23	1.7	2.6	2.0	60	0.1	5.0	5.0
24	1.6	0.8	1.2	61			
25	4.8	4.8	4.8	62			
26	5.0	5.0	5.0	63	0.1	5.0	4.9
27	5.0	5.0	5.0	64	0.1	0	4.9
28	5.0	5.0	5.0	65	0.1	5.0	5.0
29	4.9	5.0	4.9	66	0.1	0	0
30	0.4	2.8	2.8	67	4.9	4.9	4.9
31	0.4	0	0	68	4.9	4.9	4.9
32	0.3	0	0	69	4.9	4.9	4.9
33	0	0	0	70	4.9	4.9	4.9
34	5.0	0	5.0	71	0.1	0.1	0.1
35	0	5.0	5.0	72	3.5	3.3	3.1
36	0.8	0	2.8	73	0.1	3.2	3.3
37	0.2	0	0	74	0.1	3.2	3.0

IC357 (TC74HC367AF) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	4.4	4.3	4.3
2	0	0	0
3	0	0	0
4	4.5	4.4	4.4
5	4.5	2.3	2.3
6	5.4	5.0	5.0
7	4.7	2.5	2.5
8	0	0	0
9	4.8	4.8	4.7
10	4.8	4.8	4.8
11	0	0	0
12	0	0	0
13	4.8	4.7	4.7
14	4.5	4.4	4.5
15	4.5	4.4	4.5
16	5.0	5.0	5.0

IC358 (TC74HC367AF) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0.6	0.6	0.6
2	4.9	4.9	4.8
3	4.9	4.9	-
4	4.9	4.9	4.8
5	4.8	4.8	4.7
6	4.3	1.8 to 2.3	2.2 to 2.7
7	4.7	2.5	2.5
8	0	0	0
9	4.4	2.2	2.2
10	4.4	2.2	2.3
11	4.8	4.7	4.7
12	0	4.6	4.6
13	5.0	4.9	4.9
14	4.9	4.8	4.8
15	5.0	4.8	4.8
16	5.0	5.0	5.0

*1 : COPY BIT LED
Off : 5V
On : 0V

*2 : It depends on the key input from Parallel remote controller. If the remote controller is not connected, th voltage is at 0V.

*3 : The voltage depends on the selection of SW2 (DIP SW).

IC5024 (HD74HC4053FP) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0	0.3	-0.5
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	-4.9	-4.9	-5.0
8	0	0	0
9	0	4.9	5.0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	-0.7 to -0.2	-1.0 to -0.5
14	0	0	0
15	0	0	0
16	5.0	5.0	5.0

IC359 (TC7S04AF) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0	0	0.1
2	0.2	0.3	0.3
3	0	0	0
4	4.7	4.7	4.7
5	5.0	5.0	5.0

Q13 (DTC114TK) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	0	0	0
C	0	0	0
B	5.0	5.0	5.0

Q14 (DTA124EK) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	5.0
C	5.0	5.0	5.0
B	0	0	0

Q201 (DTA124ES) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	5.0
C	0	0	3.4
B	5.0	5.0	2.8

Q202 (2SC2412K) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	-3.8	0	3.9
C	-4.9	5.0	5.0
B	-4.7	4.6	4.6

Q203 (2SA1037K) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	3.9	-3.9	-3.9
C	5.0	-4.9	-4.9
B	4.6	-4.7	-4.7

Q208 (DTC114TS) [V]

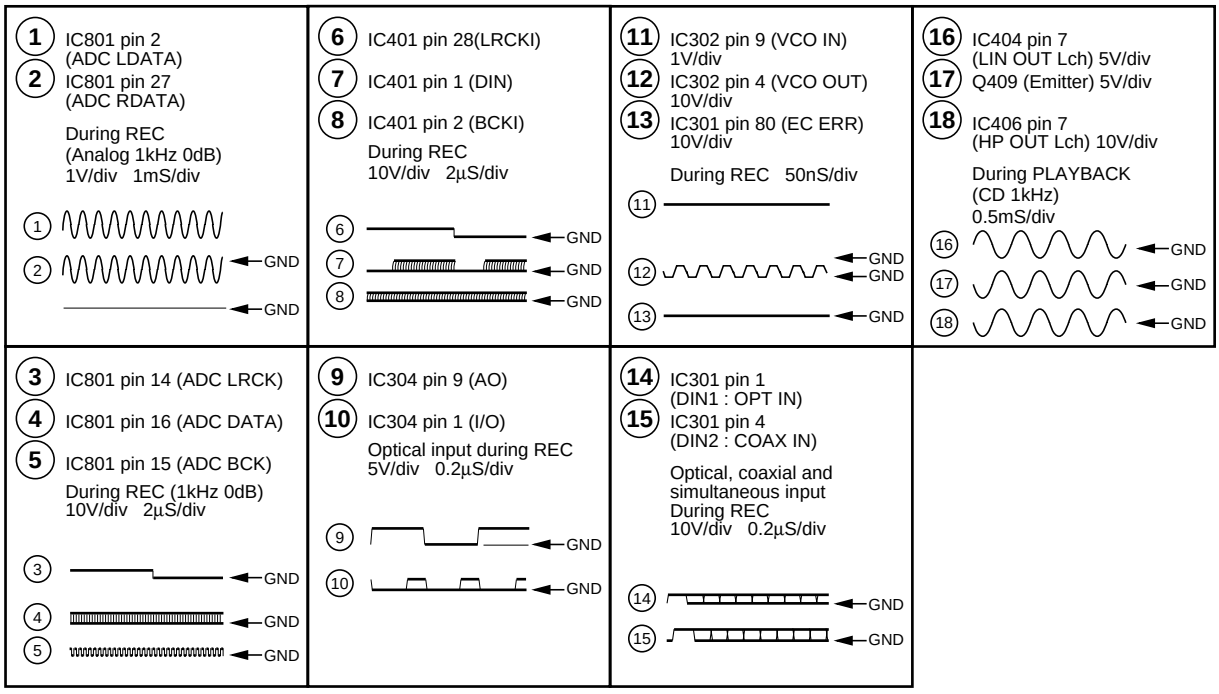
Pin No.	MODE		
	STOP	PLAY	REC
E	0	0	0
C	0.6	0.6	0.6
B	4.4	4.3	4.3

Q5026 (DTC124ES) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	5.0
C	5.0	3.6	3.6
B	0	5.0	5.0

● AUDIO DIGITAL BOARD ASSY

• Measuring condition: DC input unless otherwise noted.


1 IC801 pin 2 (ADC LDATA)
2 IC801 pin 27 (ADC RDATA)
During REC (Analog 1kHz 0dB) 1V/div 1mS/div
GND
6 IC401 pin 28(LRCKI)
7 IC401 pin 1 (DIN)
8 IC401 pin 2 (BCKI)
During REC 10V/div 2µS/div
11 IC302 pin 9 (VCO IN) 1V/div
12 IC302 pin 4 (VCO OUT) 10V/div
13 IC301 pin 80 (EC ERR) 10V/div
During REC 50nS/div
16 IC404 pin 7 (LIN OUT Lch) 5V/div
17 Q409 (Emitter) 5V/div
18 IC406 pin 7 (HP OUT Lch) 10V/div
During PLAYBACK (CD 1kHz) 0.5mS/div
3 IC801 pin 14 (ADC LRCK)
4 IC801 pin 16 (ADC DATA)
5 IC801 pin 15 (ADC BCK)
During REC (1kHz 0dB) 10V/div 2µS/div
9 IC304 pin 9 (AO)
10 IC304 pin 1 (I/O)
Optical input during REC 5V/div 0.2µS/div
14 IC301 pin 1 (DIN1 : OPT IN)
15 IC301 pin 4 (DIN2 : COAX IN)
Optical, coaxial and simultaneous input During REC 10V/div 0.2µS/div

IC301 (LC89585) [V]

Pin No.	MODE STOP	PLAY	REC	Pin No.	MODE STOP	PLAY	REC	Pin No.	MODE STOP	PLAY	REC
1	0	0	0	35	2.0	2.0	2.0	69	0	0	0.8
2	0	0	0	36	0	2.5	2.5	70	0	0	0
3	0	0	0	37	0	5.0	0	71	0	0	0.7
4	0	0	0	38	2.2	2.2	2.2	72	0	0	0
5	2.4	2.4	2.4	39	2.7	2.7	2.6	73	0	0	0
6	2.4	2.4	2.4	40	0	0	0	74	0	0	0
7	5.0	5.0	5.0	41	5.0	5.0	5.0	75	5.0	5.0	5.0
8	1.8	1.8	1.8	42	2.0	2.0	2.2	76	2.6	0	2.5
9	0	0	0	43	2.0	2.2	2.2	77	2.7	5.0	2.7
10	2.5	2.5	2.5	44	0	2.4	0	78	2.4	0	2.4
11	2.5	2.5	2.5	45	2.0	2.0	2.0	79	2.4	0	2.4
12	0	0	0	46	2.5	2.5	2.5	80	0	5.0	0
13	5.0	5.0	5.0	47	2.4	2.4	2.4	81	0	0	0
14	2.0	2.3	2.4	48	2.0	2.0	2.1	82	0	0	0
15	0	0	0	49	0	0	0	83	5.0	0	5.0
16	0	0	0	50	4.9	4.9	4.9	84	0	0	4.9
17	0	0	0	51	0	0	0	85	0	0	3.1
18	0	5.0	5.0	52	5.0	5.0	3.9	86	0	0	0.6
19	0	5.0	5.0	53	5.0	5.0	4.1	87	0	0	0.7
20	5.0	5.0	5.0	54	0	0	2.3	88	0	0	1.9
21	0	0	0	55	0	0	2.3	89	5.0	5.0	5.0
22	0	0	0	56	0	0	2.4	90	0	0	0
23	0	0	0	57	0	0	2.5	91	1.4	5.0	1.3
24	0	0	0	58	0	0	2.5	92	5.0	5.0	5.0
25	0	0	0.1	59	0	0	2.5	93	5.0	4.9	4.9
26	2.4	2.4	5.0	60	0	0	2.4	94	0.2	0	0.3
27	2.4	2.4	0 to 3.4	61	5.0	5.0	5.0	95	0	0	0
28	2.4	2.4	0 to 2.4	62	0	0	0	96	0	0	0
29	5.0	5.0	5.0	63	0	0	1.4	97	4.8	4.8	4.8
30	0	1.6	0	64	0	0	1.3	98	4.9	4.8	4.8
31	2.0	2.0	2.2	65	0	0	2.4	99	0.6	2.3	2.3
32	2.5	0	2.5	66	5.0	5.0	2.0	100	5.0	5.0	5.0
33	0	0	0.6	67	5.0	5.0	4.1				
34	0	0.6	0.6	68	0	0	0.9				

IC304 (MB81C4256A -70PJ) [V]

Pin No.	MODE STOP	PLAY	REC
1	0	0	1.4
2	0	0	1.4
3	5.0	5.0	4.1
4	5.0	5.0	2.0
5	0	0	2.5
6	-	-	-
7	-	-	-
8	-	-	-
9	0	0	1.3
10	0	0	1.4
11	0	0	2.5
12	0	0	2.5
13	5.0	5.0	5.0
14	0	0	2.5
15	0	0	2.5
16	0	0	2.5
17	0	0	2.5
18	0	0	2.5
19	-	-	-
20	-	-	-
21	-	-	-
22	5.0	5.0	4.1
23	5.0	5.0	3.9
24	0	0	0.9
25	0	0	0.8
26	0	0	0

IC404 (NJM5532MD) [V]

Pin No.	MODE STOP	PLAY	REC
1	0	0	0
2	1.2	1.2	1.2
3	1.2	1.2	1.2
4	-9	-9	-9
5	0	0	0
6	0	0	0
7	0	0	0
8	9	9	9

IC406 (M5218AFP) [V]

Pin No.	MODE STOP	PLAY	REC
1	0	0	0
2	0	0	0
3	0	0	0
4	-9	-9	-9
5	0	0	0
6	0	0	0
7	0	0	0
8	9	9	9

IC801 (AK5340-VS) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	2.5	2.5	2.5
2	2.5	2.5	2.5
3	5.0	5.0	2.4
4	5.0	5.0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	5.0	5.0	0
11	0	0	0
12	5.0	5.0	5.0
13	0	0	0
14	2.5	2.5	2.5
15	2.0	2.0	2.2
16	0	0	2.5
17	5.0	5.0	5.0
18	5.0	5.0	5.0
19	0	0	0
20	2.1	2.1	2.1
21	0	0	0
22	0	0	0
23	0	0	0
24	5.0	5.0	5.0
25	0	0	0
26	5.0	5.0	2.4
27	2.5	2.5	2.5
28	2.5	2.5	2.5

IC803, 804 (NJM5532DD) [V]

Pin No.	MODE		
	STOP	PLAY	REC
1	0	0	0
2	0	0	0
3	0	0	0
4	-9	-9	-9
5	0	0	0
6	0	0	0
7	0	0	0
8	9	9	9

Q301 (DTA114TS) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	5.0
C	0.5	0.4	0.4
B	5.0	5.0	5.0

Q303 (DTA114TS) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	5.0
C	0.9	0.8	0.8
B	5.0	5.0	5.0

Q304 (DTC114ES) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	0	0	0
C	2.0	-	-
B	0.2	-0.1 to 0	0

Q401 (DTC124ES) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	-9	-9	-9
C	1.4	-9	-9
B	-9	2.0	2.0

Q402 (DTA114ES) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	5.0
C	-9	5.0	5.0
B	5.0	3.6	3.6

Q403, 405 (DTA124ES) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	5.0	5.0	5.0
C	-9	5.0	5.0
B	5.0	0.2	0.2

Q407, 408 (2SD2114K) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	-9	-9	-9
C	1.1	-9	-9
B	-9	3.7	3.7

Q409 (2SD2114K) [V]

Pin No.	MODE		
	STOP	PLAY	REC
E	0	0	0
C	0	0	0
B	0.6	-0.7	-0.1

5-2. PARTS INFORMATION

The contents described here is the basic information. It might differ from the information described in the circuit diagram.

● PD4786A (IC356) on the SERVO UCOM BOARD ASSY

(1) Function of terminal

No.	Symbol	Terminal Description	I/O	Initial Voltage	Function
1	P43/AD3	AD3	I/O	-	Data address line
2	P44/AD4	AD4	I/O	-	
3	P45/AD5	AD5	I/O	-	
4	P46/AD6	AD6	I/O	-	
5	P47/AD7	AD7	I/O	-	
6	P50/A8	A8	O	-	Address line
7	P51/A9	A9	O	-	
8	P52/A10	A10	O	-	
9	P53/A11	A11	O	-	
10	P54/A12	A12	O	-	
11	P55/A13	A13	O	-	
12	NC	GND	-	-	Not used.
13	P56/A14	A14	O	-	Address line
14	P57/A15	A15	O	-	
15	Vdd	+5V	-	-	Positive voltage supply terminal
16	AVss	GND	-	-	GND for A/D converter
17	P70/AN0	XOPEN	I	-	OPEN SW. It goes LOW when the tray is completely open.
18	P71/AN1	XCLMP	I	-	CLAMP SW. It goes LOW when the clamper goes down.
19	NC	GND	-	-	Not used.
20	P72/AN2	GND	I	-	
21	P73/AN3	GND	I	-	
22	P74/AN4	TEPP	I (A)	-	Tracking Error Peak to Peak (For adjusting tracking gain).
23	P75/AN5	RFT	I (A)	-	Upper side of reproduce RF envelope
24	P76/AN6	RFB	I (A)		Lower side of reproduce RF envelope
25	P77/AN7	MACK	I	-	It goes LOW when serial hand-shaking.
26	AVref	+5V	-	-	Reference voltage input for A/D converter
27	AVdd	+5V	-	-	Analog voltage applied to A/D converter
28	Vdd	+5V	-	-	Positive voltage supply terminal
29	P20/NM1	XPFAIL	I	-	It goes LOW when detecting blackout.
30	P21/INTP0	FG	I	-	It detects falling edge of spindle FG.
31	P22/INTP1	SCOR	I	-	EFM decoder. It detects falling edge of frame sync signal.
32	P23/INTP2	ATIP	I	-	It detects rising and falling edges of ATIP sync signal.
33	P24/INTP3	ESYN	I	-	EFM encoder. It detects falling edge of frame sync signal.
34	P25/INTP4	XRFDT	I	-	It goes LOW when detecting EFM reproduce RF signal.
35	P26/INTP5	TOCP	I	-	TOC position sensor. (for stopping slider when the TOC position is at LOW level.
36	P27/INTP3/TI	SENS	I	-	SENS signal of SONY servo IC.
37	NC	GND	-	-	Not used.
38	P30/TxD	FOK	I	-	Focus okay input. (It goes HIGH when focused properly.)
39	P31/RxD	XECE	O	H	It goes LOW when reading test jig enable output.
40	P32/SO/SBO	MSO	O	L	Clock sync serial transfer data output

CAUTION : (A) idicates ANALOG IN.

No.	Symbol	Terminal Description	I/O	Initial Voltage	Function
41	P33/SI/SBI	MSI	I	L	Clock sync serial transfer data input
42	P34/SCK	MSCK	O	H	Clock sync serial transfer clock output
43	NC	GND	-	-	Not used.
44	P80/T000	XFUSE	I	H	It goes LOW when in the communicaation between LC89585 and mode controller.
45	P81/T001	GFS	I	-	GFS input (It goes HIGH when GFS is okay.)
46	P82/T002	ECLV	O	H	Spindle servo EFM/Wobble CLV mode
47	P83/T003	CLV	O	H	Spindle servo CLV/CAV mode
48	P84/T010	SPSQ	O	-	Spindle drive PWM output when in the spindle CAV.
49	P85/T001	MREQ	O	H	It goes LOW when seiral hand-shaking.
50	RESET	XRST	I	-	It goes LOW when reset signal is input.
51	X1	CLOCK	I	-	Crystal connection terminal for system clock oscillation
52	X2	CLOCK	-	-	When feeding an external clock, it should be input to X1 terminal.
53	NC	GND	-	-	Not used.
54	Vss	GND	-	-	GND terminal
55	WDTO	NC	O	L	Not used.
56	P00/RTP0	XSUBQE	O	L	EFM decoder. It goes LOW when reading subcode Q is enabled.
57	NC	GND	-	-	Not used.
58	P01/RTP1	XENCE	O	L	It goes HIGH when LC89585 serial enable is output.
59	P02/RTP2	XASYN	O	L	ATIP frame sync. LOW.
60	P03/RTP3	XEXSC	O	H	It goes LOW when LC89585 external sync enable is output.
61	P04/RTP4	SSO	O	L	Serial data output for SONY servo IC command.
62	P05/RTP5	SSCK	O	H	Seiral clock output for SONY servo IC command
63	P06/RTP6	XLT	O	H	It goes LOW when SONY servo IC command is latched.
64	P07/RTP7	RECE	O	L	It goes HIGH when laser diode recording power is on.
65	EA Npp	EA	I	-	It is used as an internal ROM mode with connecting to +5V.
66	Vss	GND	-	-	GND terminal
67	P93/TMD	RAME	O	H	It goes HIGH when the external SRAM is enabled.
68	P92/TAS	XSVRST	O	L	It goes LOW when servo system IC mode control reset signal is output.
69	P91/WR	XWR	O	L	Strobe signal output for external memory writing operation
70	P90/RD	XRD	O	L	Strobe signal output for external memory reading operation
71	ASTB	ASTB	O	-	Signal to externally latch the lower address signal for accessing the external memory
72	P40/ADD	AD0	I/O	-	Data address line
73	P41/AD1	AD1	I/O	-	
74	P42/AD2	AD2	I/O	-	

(2) External port output from IC207 (PDJ006A) on the SERVO UCOM BOARD ASSY
(External RAM area (8000H ~ 8FFFH))

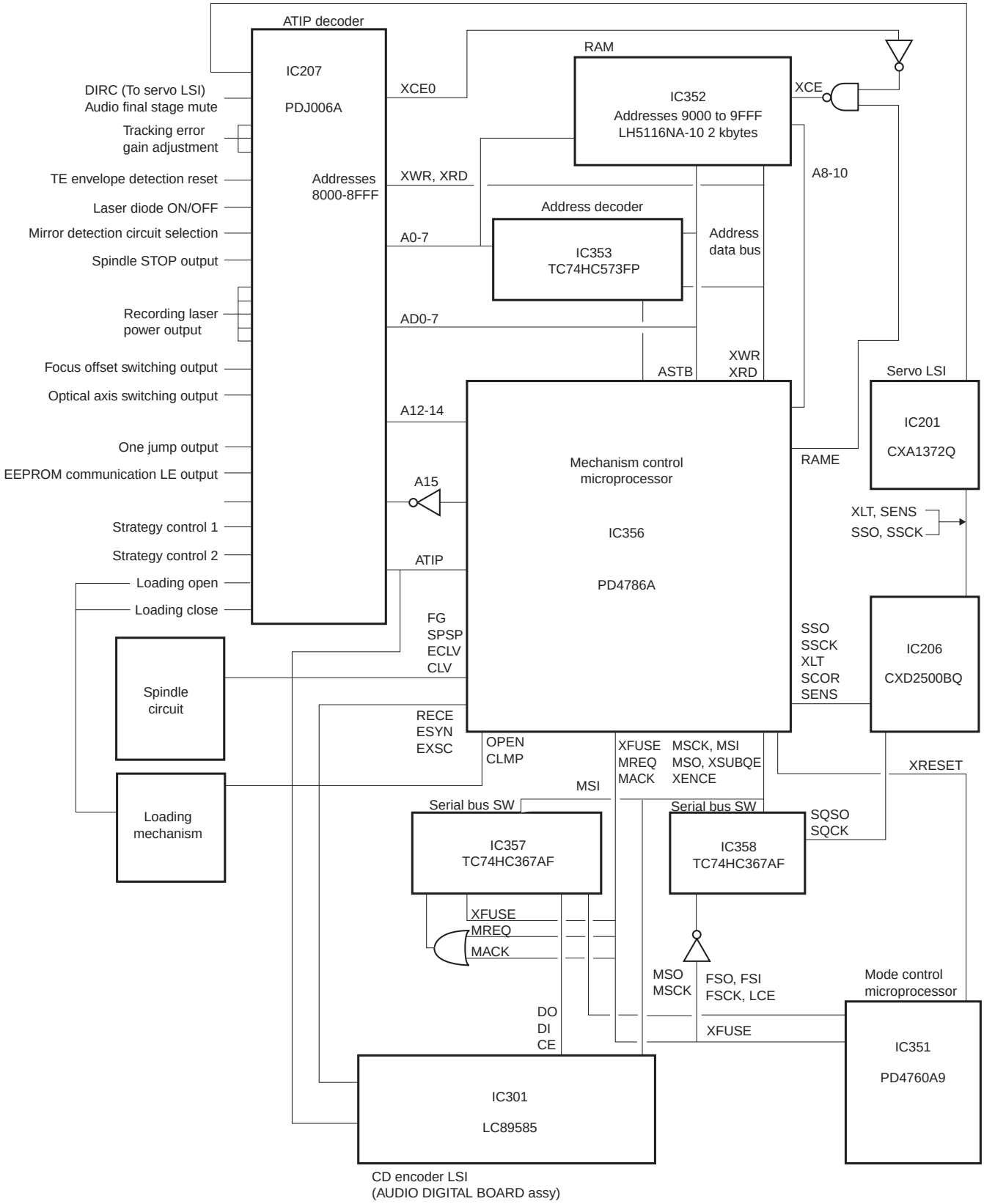
No.	Symbol	Terminal Description	I/O	Initial Voltage	Function
45	POA0	LDPW0	O	L	LSB — Setting of 5-bit (D/A output) recording laser power
46	POA1	LDPW1	O	L	
47	POA2	LDPW2	O	L	
49	POA3	LDPW3	O	L	
50	POA4	LDPW4	O	L	MSB
51	POA5	SSEL	O	L	It goes LOW when the tracking error envelope reset signal is detected.
52	POA6	-	O	L	Not used.
53	POA7	LJUMP	O	L	It goes HIGH when in the N track jump operation.
54	POB0	LIN	O	L	It goes HIGH when in the loading close operation.
55	POB1	LOUT	O	L	It goes HIGH when in the loading open operation.
56	POB2	KOJK	O	L	Turning on/off of laser axis switching circuit
57	POB3	EECS	O	L	EEPROM data writing/reading enable output
59	POB4	-	O	L	Not used.
60	POB5	FC＿OST	O	L	Focus offset switching output. It is LOW when searching and HIGH when in the mode other than searching.
61	POB6	STCN1	O	L	Strategy control output 1 (Refer to the table below.)
62	POB7	STCN2	O	L	Strategy control output 2 (Refer to the table below.)
63	POC0	TEG0	O	L	LSB — Tracking error amp gain adjustment
64	POC1	TEG1	O	L	
65	POC2	TEG2	O	L	
66	POC3	TEGM	O	L	MSB
67	POC4	DIRC	O	H	It goes LOW when DIRC is output from SONY servo IC.
69	POC5	XCDMIR	O	H	Mirror detection circuit select SW. CD＿ R/$\overline{\text{CD}}$
70	POC6	XLDON	O	H	Laser diode OFF/$\overline{\text{ON}}$
71	POC7	XAMUTE	O	H	When it is HIGH, signal is muted at last stage of audio path. (It depends on mode controller instruction.) While in the REC PAUSE / STOP mode with input switching, mute is turned on.

* According to the characteristics of CD-R disc, the CR200 switches the recording EFM. There are 4 kinds of pulse (strategy) and they are controlled by the above mentioned output 1 and 2 (STCN1 & STCN2).

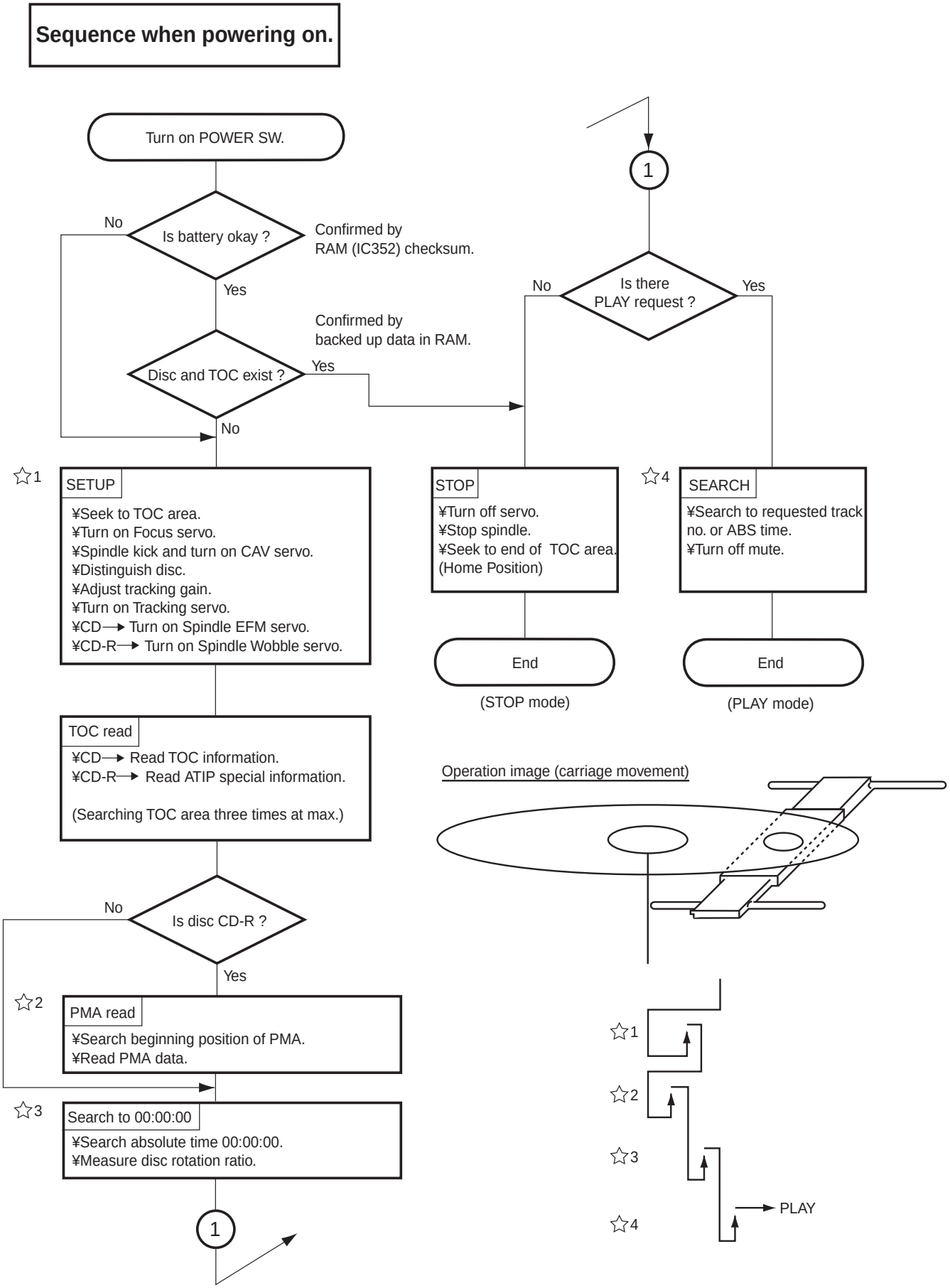
STCN1	STCN2	Strategy Type
0	0	EFM1
0	1	EFM2
1	0	EFM3
1	1	EFM4

CAUTION : In the Test mode, only “EFM2” can be selected.

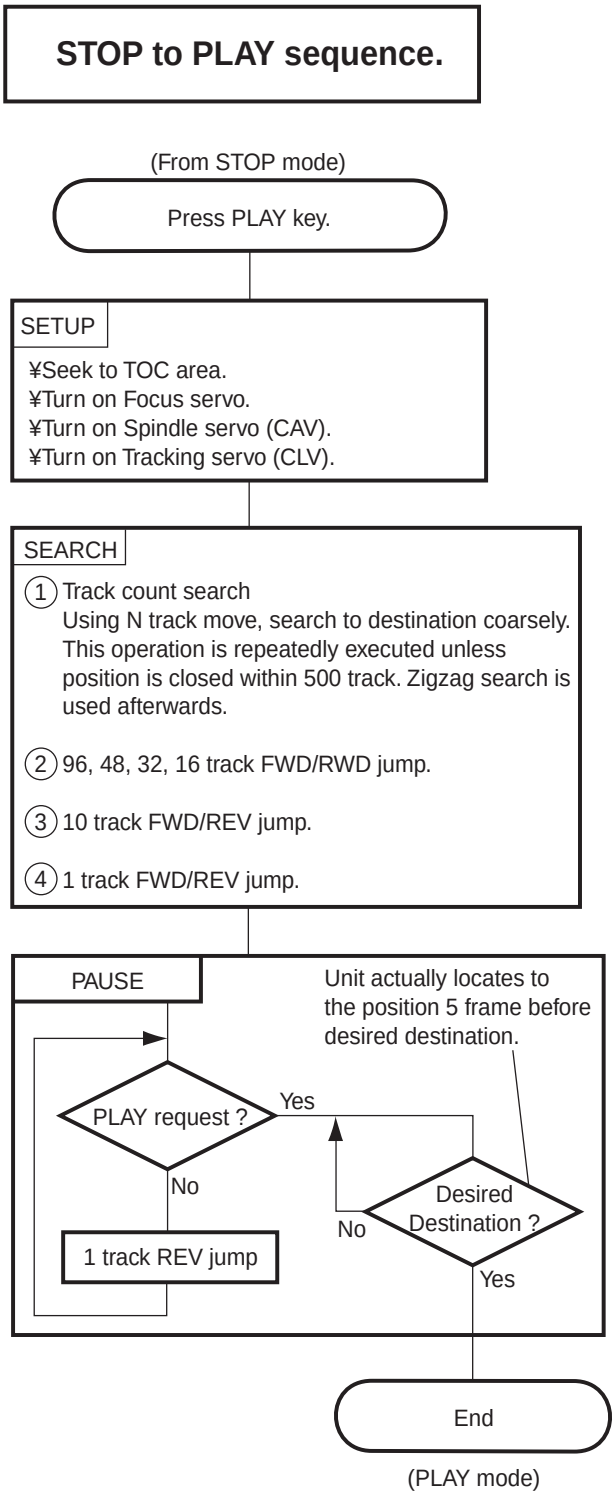
(3) Surrounding Circuit Block Diagram (Servo System)



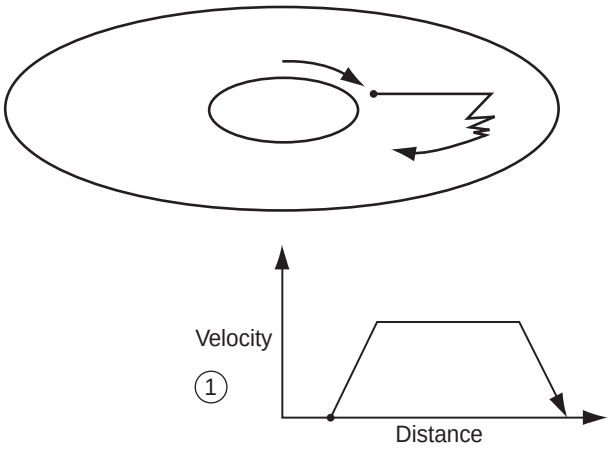
(4) Operation Flow Chart 1



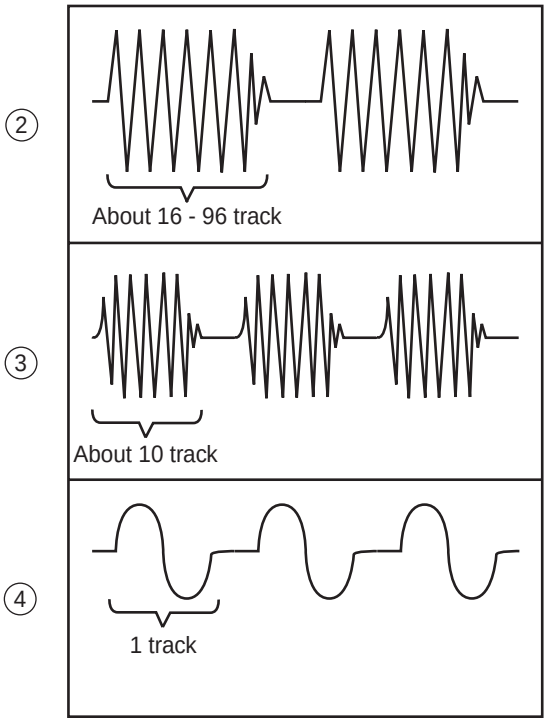
(5) Operation Flow Chart 2


STOP to PLAY sequence.
(From STOP mode)
Press PLAY key.
SETUP
¥Seek to TOC area.
¥Turn on Focus servo.
¥Turn on Spindle servo (CAV).
¥Turn on Tracking servo (CLV).
SEARCH
1 Track count search
Using N track move, search to destination coarsely. This operation is repeatedly executed unless position is closed within 500 track. Zigzag search is used afterwards.
2 96, 48, 32, 16 track FWD/RWD jump.
3 10 track FWD/REV jump.
4 1 track FWD/REV jump.
PAUSE
Unit actually locates to the position 5 frame before desired destination.
PLAY request ?
Yes
No
Desired Destination ?
No
Yes
1 track REV jump
End
(PLAY mode)

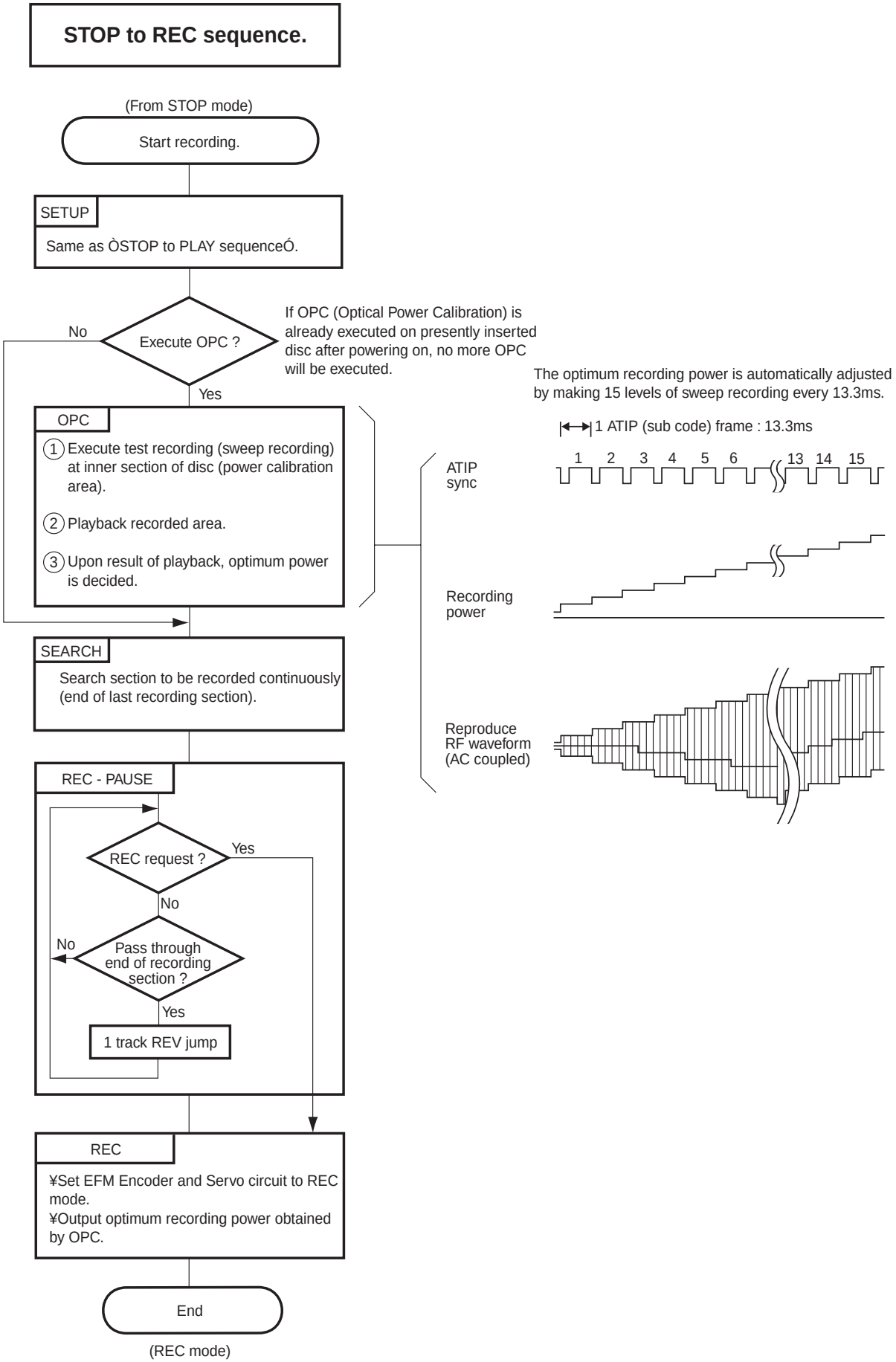
Operation image



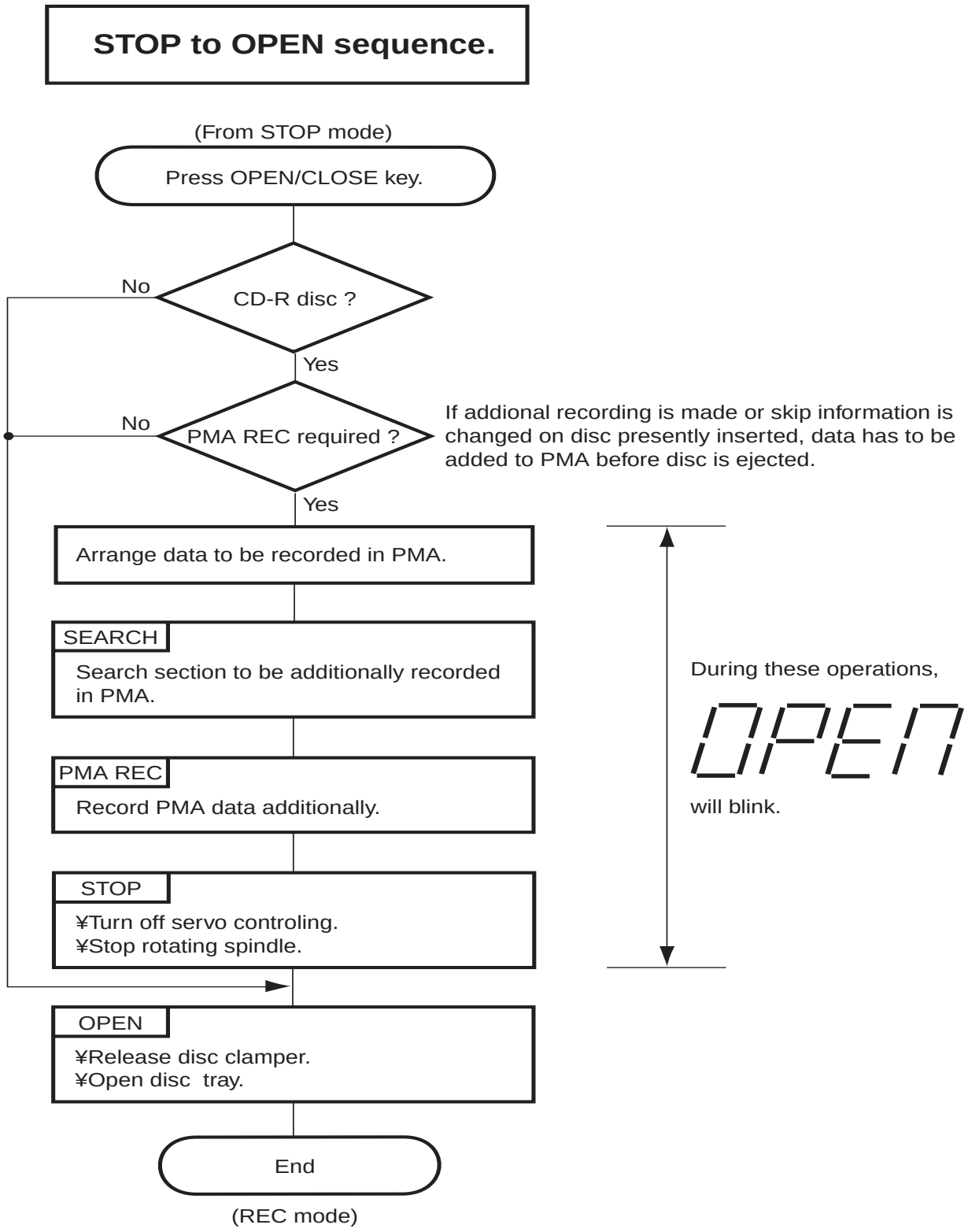
Tracking Error Waveform



(6) Operation Flow Chart 3

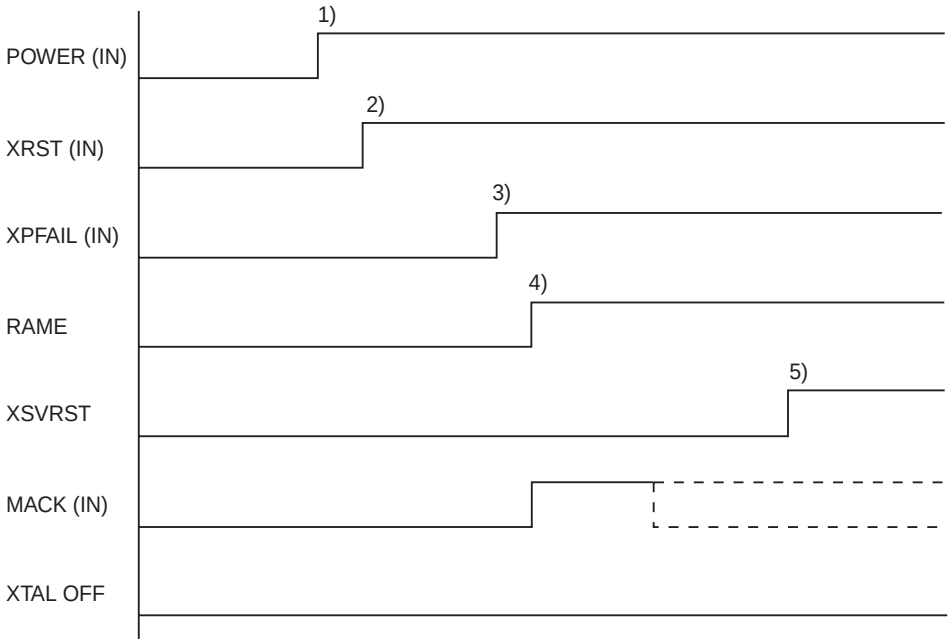

STOP to REC sequence.
(From STOP mode)
Start recording.
SETUP
Same as ÒSTOP to PLAY sequenceÓ.
Execute OPC ?
No
Yes
If OPC (Optical Power Calibration) is already executed on presently inserted disc after powering on, no more OPC will be executed.
OPC
1 Execute test recording (sweep recording) at inner section of disc (power calibration area).
2 Playback recorded area.
3 Upon result of playback, optimum power is decided.
The optimum recording power is automatically adjusted by making 15 levels of sweep recording every 13.3ms.
1 ATIP (sub code) frame : 13.3ms
ATIP sync
1 2 3 4 5 6 13 14 15
Recording power
Reproduce RF waveform (AC coupled)
SEARCH
Search section to be recorded continuously (end of last recording section).
REC - PAUSE
REC request ?
Yes
No
Pass through end of recording section ?
No
Yes
1 track REV jump
REC
¥Set EFM Encoder and Servo circuit to REC mode.
¥Output optimum recording power obtained by OPC.
End
(REC mode)

(7) Operation Flow Chart 4



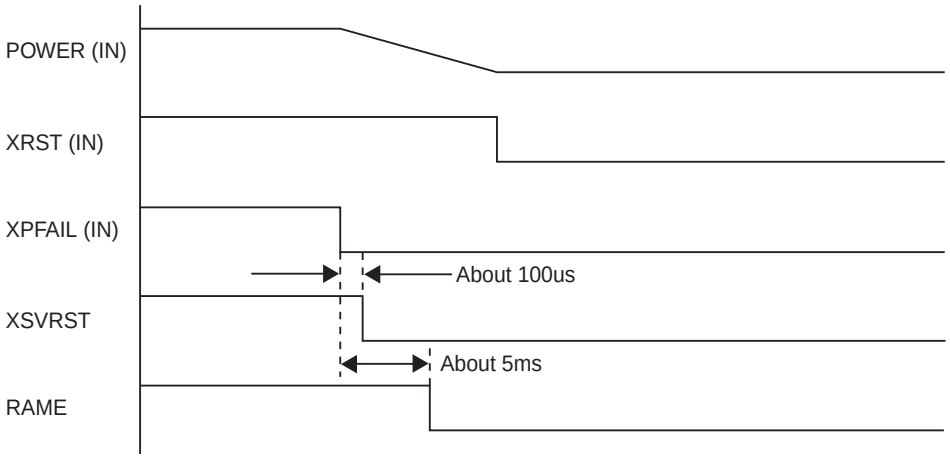
(8) Timing Chart

① Timing chart when powering on



1) Turn on the power.
2) XRST goes ÒHÓ and reset is turned off.
3) After reset is turned off, the unit stands by till XPFAIL goes ÒHÓ.
4) After XPFAIL goes ÒHÓ, the microprocessor starts operating. RAME goes ÒHÓ and the external RAM is put into ÒenableÓ condition.
5) XSVRST goes ÒHÓ and the servo circuit starts operating.

② Timing chart when in blackout.

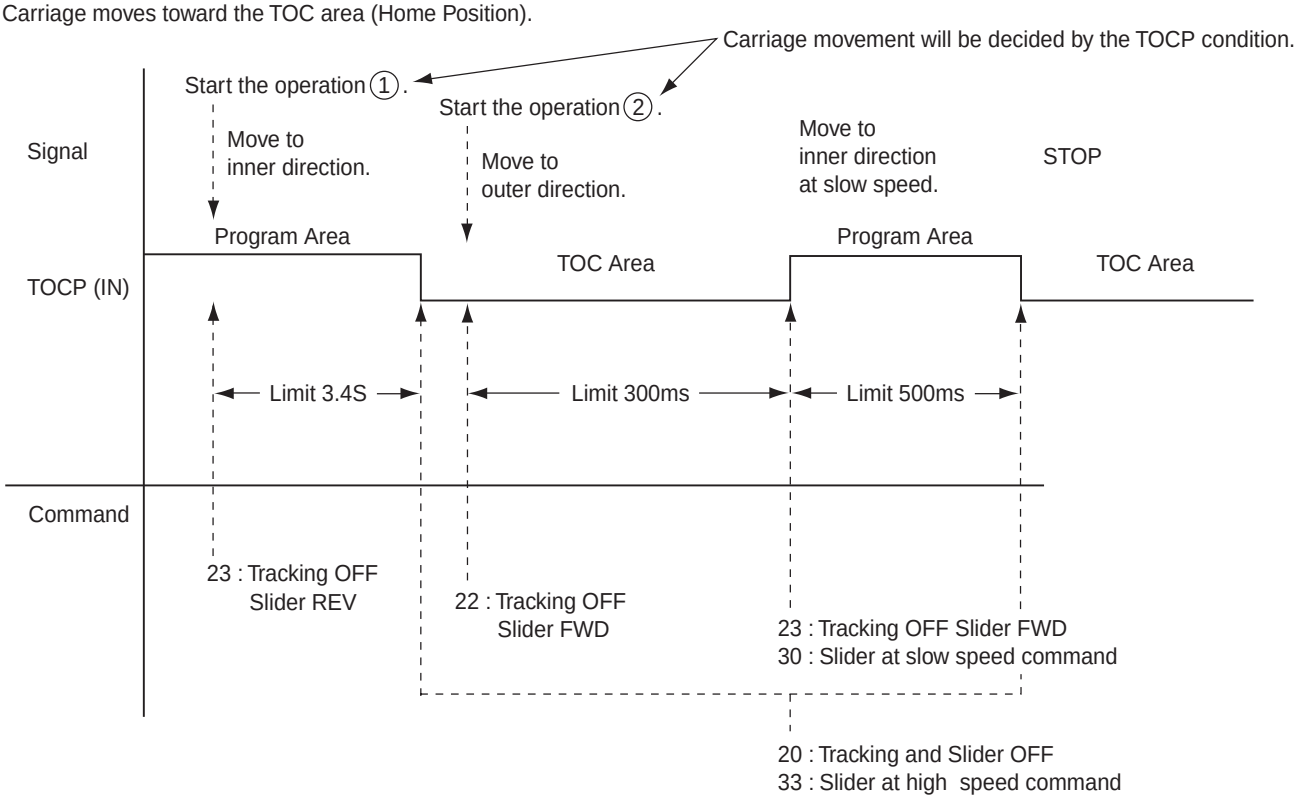


1) If power supply voltage drops and at a certain level, XPFAIL goes ÒLÓ.
2) When XPFAIL is at ÒLÓ, the unit is in internal interruption mode and the Current Operation mode and disc data wiill be backed up.
3) At the same time, XSVRST goes ÒLÓ and the servo circuit will be reset. RAME goes ÒLÓ and the external SRAM will be disabled.
4) XRST also goes ÒLÓ and is reset.

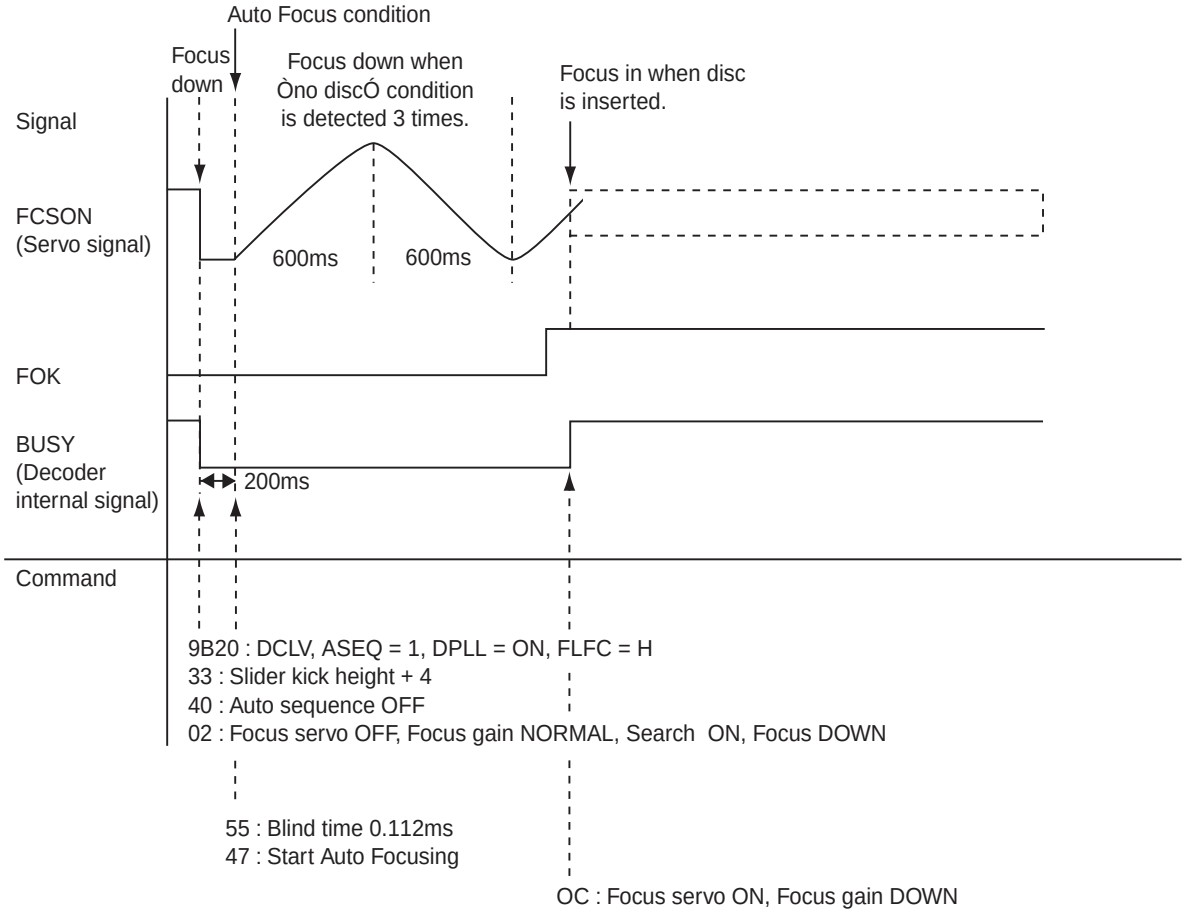
CAUTION : If XRST goes ÒLÓbefore RAME goes ÒLÓ, value of backup RAM (IC352) will not be memorized correctly.

③ Seek track 0

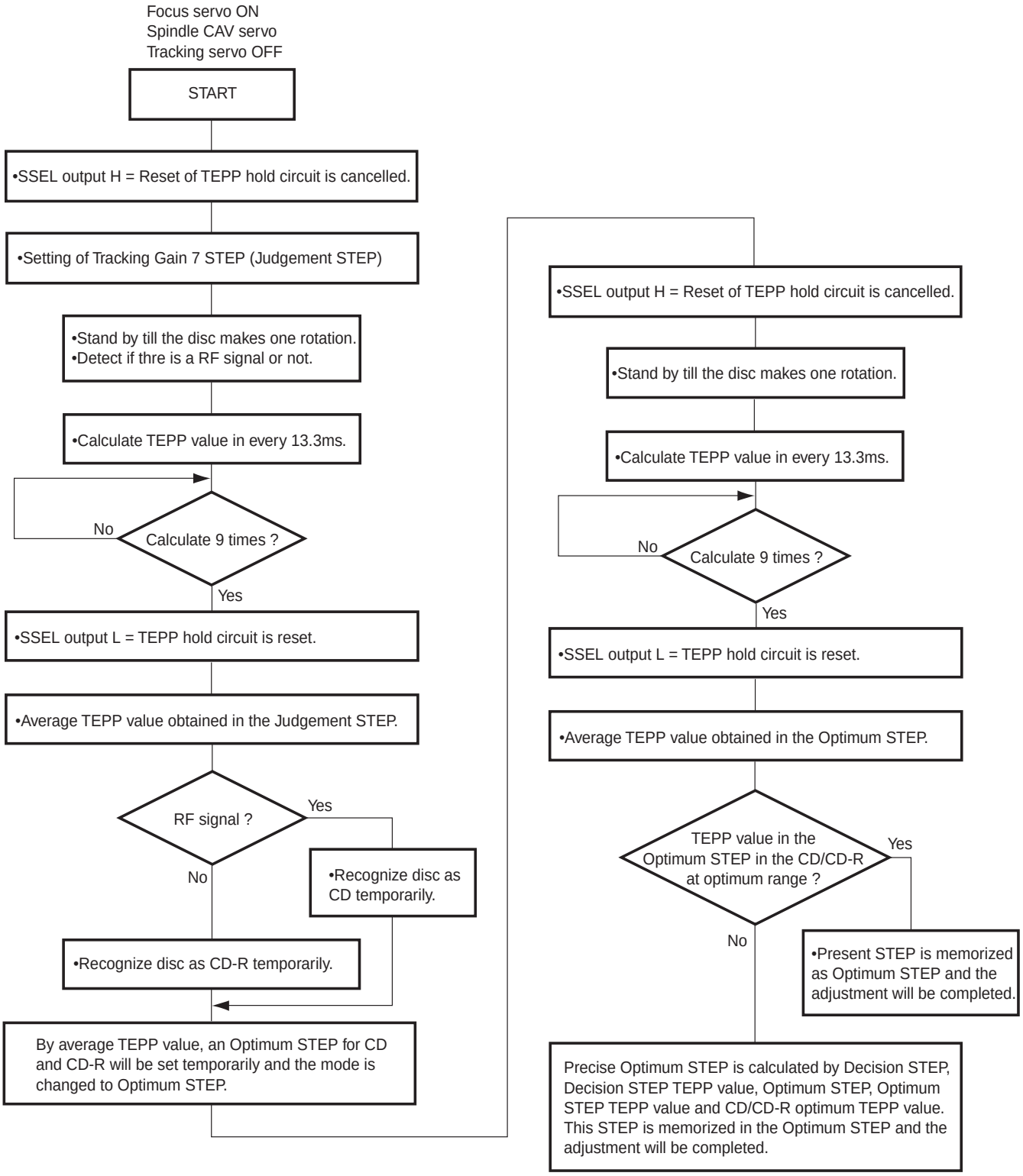
Carriage moves toward the TOC area (Home Position).



④ Focus ON


Auto Focus condition
Focus down
Focus down when Òno discÓ condition is detected 3 times.
Focus in when disc is inserted.
Signal
FCSON (Servo signal)
600ms
600ms
FOK
BUSY (Decoder internal signal)
200ms
Command
9B20 : DCLV, ASEQ = 1, DPLL = ON, FLFC = H
33 : Slider kick height + 4
40 : Auto sequence OFF
02 : Focus servo OFF, Focus gain NORMAL, Search ON, Focus DOWN
55 : Blind time 0.112ms
47 : Start Auto Focusing
OC : Focus servo ON, Focus gain DOWN

(9) Tracking Error Gain Adjusting Flow Chart


Focus servo ON
Spindle CAV servo
Tracking servo OFF
START
•SSEL output H = Reset of TEPP hold circuit is cancelled.
•Setting of Tracking Gain 7 STEP (Judgement STEP)
•Stand by till the disc makes one rotation.
•Detect if thre is a RF signal or not.
•Calculate TEPP value in every 13.3ms.
No
Calculate 9 times ?
Yes
•SSEL output L = TEPP hold circuit is reset.
•Average TEPP value obtained in the Judgement STEP.
RF signal ?
Yes
No
•Recognize disc as CD temporarily.
•Recognize disc as CD-R temporarily.
By average TEPP value, an Optimum STEP for CD and CD-R will be set temporarily and the mode is changed to Optimum STEP.
•SSEL output H = Reset of TEPP hold circuit is cancelled.
•Stand by till the disc makes one rotation.
•Calculate TEPP value in every 13.3ms.
No
Calculate 9 times ?
Yes
•SSEL output L = TEPP hold circuit is reset.
•Average TEPP value obtained in the Optimum STEP.
TEPP value in the Optimum STEP in the CD/CD-R at optimum range ?
Yes
No
•Present STEP is memorized as Optimum STEP and the adjustment will be completed.
Precise Optimum STEP is calculated by Decision STEP, Decision STEP TEPP value, Optimum STEP, Optimum STEP TEPP value and CD/CD-R optimum TEPP value. This STEP is memorized in the Optimum STEP and the adjustment will be completed.

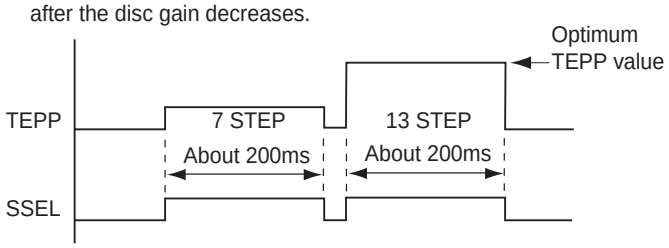
NOTE : Precise Optimum STEP

$$= \frac{\text{Decision STEP - Optimum STEP}}{\text{Decision STEP TEPP value - Optimum STEP TEPP value}} \left(\frac{\text{CD/CD-R Optimum}}{\text{TEPP value}} - \frac{\text{Optimum STEP}}{\text{TEPP value}} \right) + \text{Optimum STEP}$$

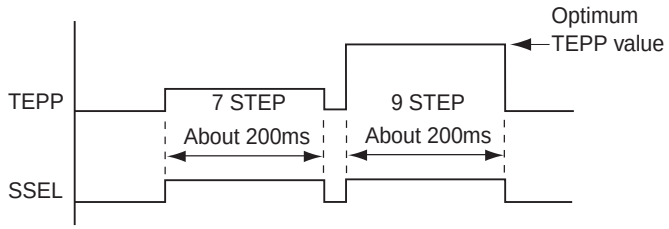
(10) Tracking Gain Adjusting Timing Chart

Optimum TEPP value : 2.494V ± 0.103V (2.372 - 2.649V)
2.26V ± 0.103V (2.157 - 2.372V)

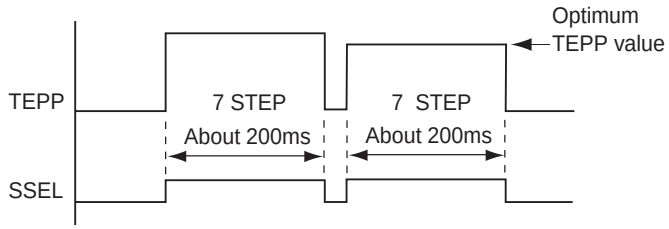
1) Example when the gain increases to the maximum after the disc gain decreases.



2) Example when the gain increases after the disc gain decreases.

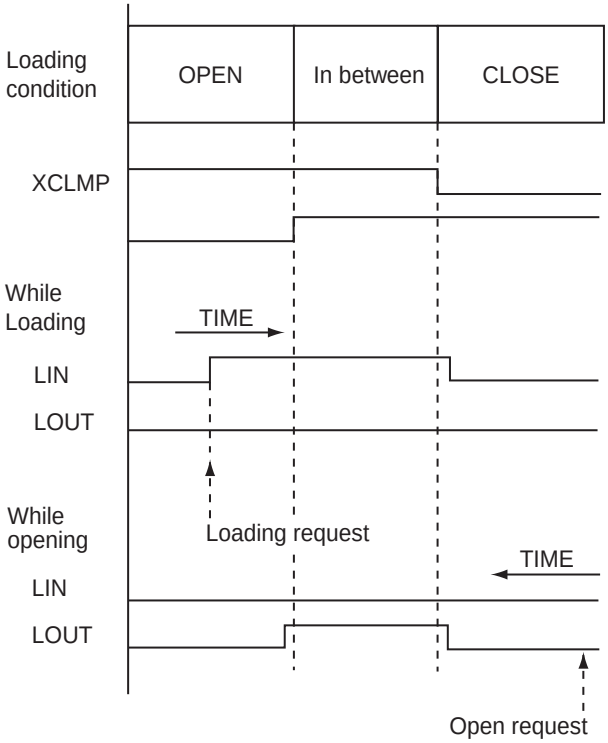


3) Example when the gain decreases to the minimum after the disc gain increases.

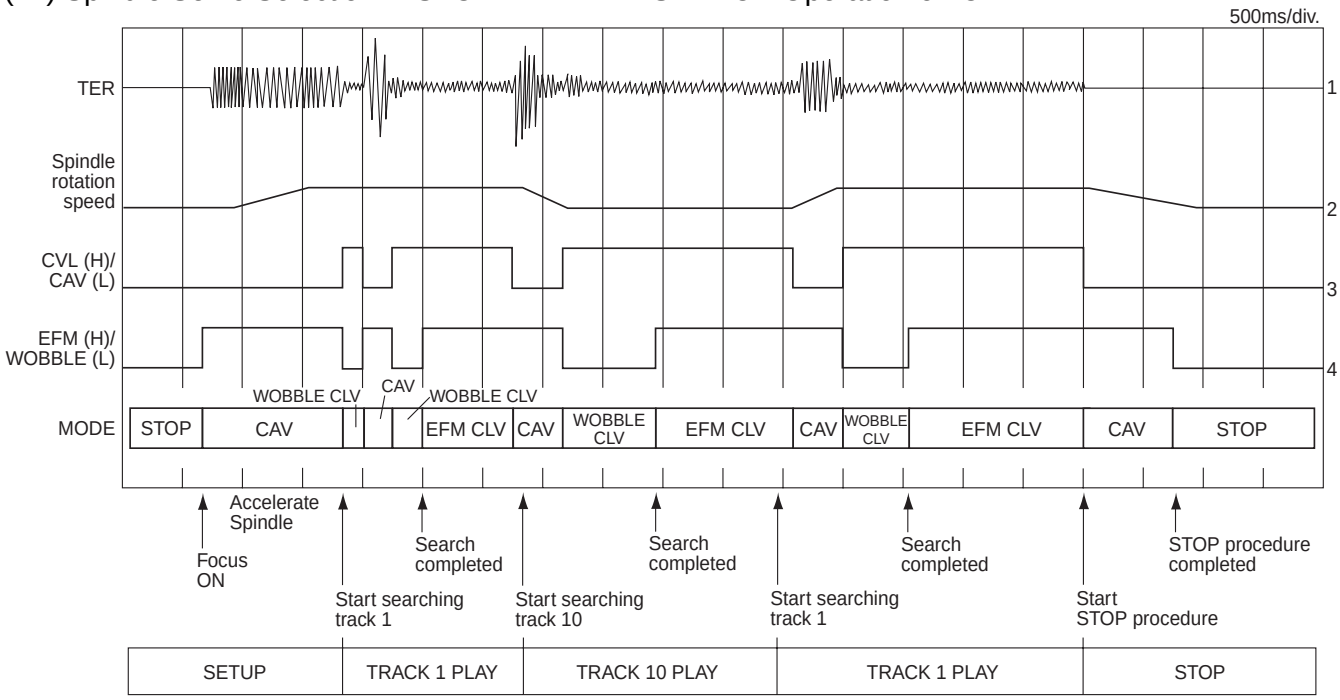


(11) Loading Control for Turntable

OPEN/CLOSE control & SW condition
The figure below indicates the relationship of loading input/output by the timing chart.



(12) Spindle Servo Selection in STOP → PLAY → SEARCH Operation on CD-R



● PD4760A9 (IC351) on the SERVO UCOM BOARD ASSY

(1) General Function

1. Operation key input analysis

The key matrix method is adopted by 5 output x 4 input (20 key max.).

The KEYIN0 is also used as a test mode detection port when powering on.

2. Remote controller input analysis

It corresponds to the two-fold cord complying to the universal standards. [It receives CD-R remote commands (A3**, AF**).]

3. Parallel remote controller input analysis

The CR200 receives the key input from DIN 8-pin connector on the rear panel.

The input command can be distinguished by the analog data (0 ~ 5V) applied to pin-28.

The table below indicates the relationship between the analog data and key distinction.

Analog Data (V)	Key Distinction	Pin No. of DIN connector
4 ~ 4.5	STOP	8
4.5 ~ 5	REV TRACK	7
3.5 ~ 4	REC	6
2 ~ 2.5	MANUAL TRACK NO	5
3 ~ 3.5	Not used.	4
1.5 ~ 2	PLAY	3
1 ~ 1.5	FWD TRACK	2
2.5 ~ 3	PAUSE	1

4. Display Output

FL display : Dynamic scan method.
Sound quality improvment is realized by Display OFF.

LED : Direct driving (REC indicator, manual, track increment)

5. Communication with mechanical contorl microcomputer

Reading/Transferring of information on mechanical opeation, disc and time information inside disc, skip information.

6. Communication with LSI (LC89585)

Reading of information such as C bit, U bit, Unlock.
Reading of data for level meter
Swiching and setting of digital interface
Controlling of digital circuit
Controlling of attenuator
Controlling of digital memory delay circuit

7. Controlling of Fs converter (PDC020A)

Controlling of Fs converter
Controlling of parallel output

8. Audio Circuit

Controlling of DAC, emphasis
Turning on/off of crystal

9. Rest controlling

10. Nominal mode system control

11. Test mode system control

(2) Function of terminal

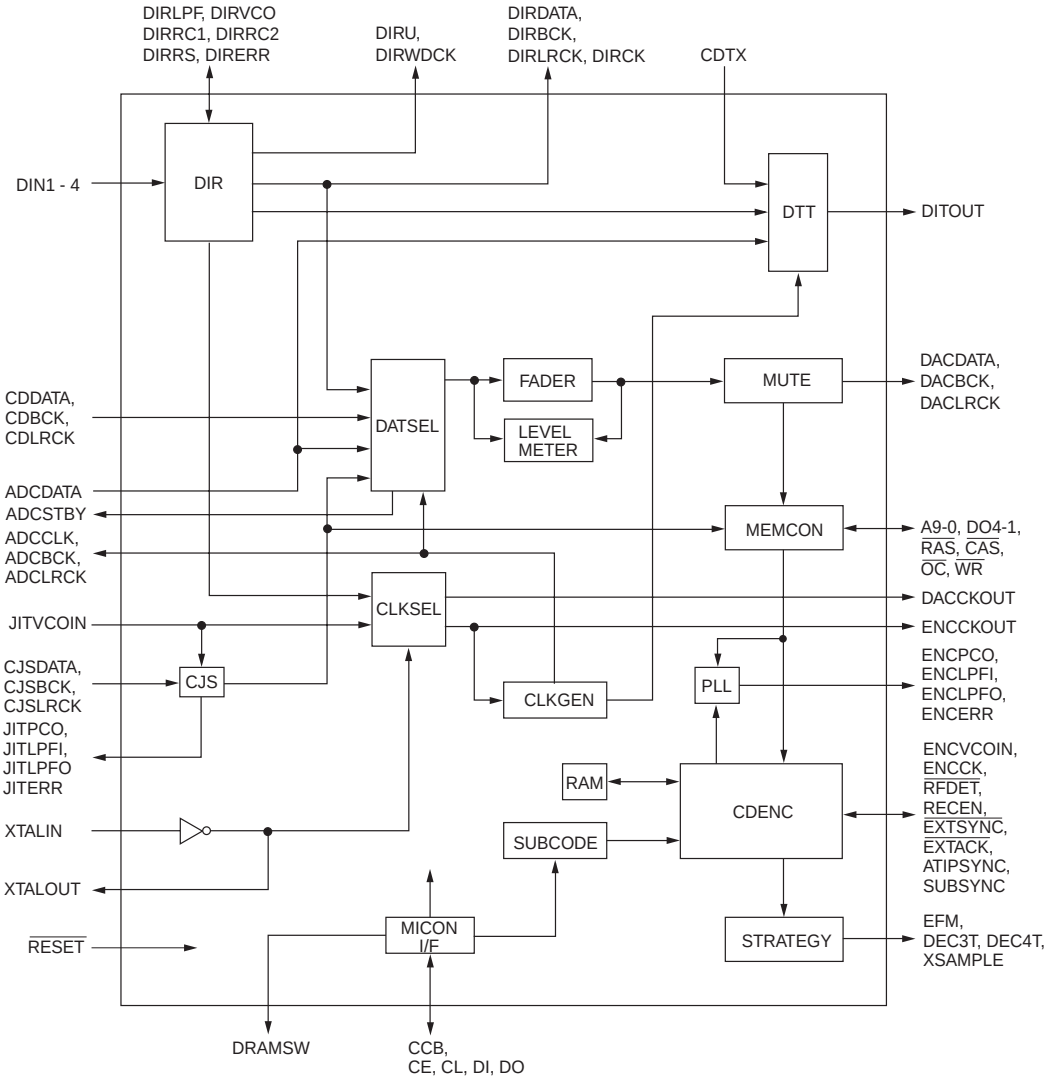
No.	Symbol	Terminal Description	I/O	Initial Voltage	Function
1	FIP6	GRID 6	O	L	FL grid output 5
2	FIP5	GRID 5	O	L	FL grid output 6
3	FIP4	GRID 4	O	L	FL grid output 7
4	FIP3	GRID 3	O	L	FL grid output 8
5	FIP2	GRID 2	O	L	FL grid output 9
6	FIP1	GRID 1	O	L	FL grid output 10
7	FIP0	GRID 0	O	L	FL grid output 11
8	VDD	-	O	L	Connected to VDD.
9	SCKO	RSCK	O	H	Serial clock for JIG communication
10	SO0	RSO	O	L	Serial output for JIG communication
11	SI0	RSI	I	-	Serial input for JIG communication
12	P24	RACK	O	L	Not used.
13	P23	RREQ	O	L	Not used.
14	SCK1	FSCK	I/O	H	LSI serial clock for mechanical controller
15	SO1	FSO	O	L	LSI serial output for mechanical controller
16	SI1	FSI	I	L	LSI serial input for mechanical controller
17	RESET	XRESET	O	L	Reset input for mode controller
18	P74	LED4	O	H	For displaying Copy Bit. L : ON

No.	Symbol	Terminal Description	I/O	Initial Voltage	Function
19	P73	LED5	O	H	Not used.
20	AVSS	GND	I	-	Connected to GND.
21	P17	XFUSE	O	H	Serial communication for mode controller. It goes LOW when in the communication.
22	P16	-	O	L	Not used.
23	P15	FSLAT	O	H	CE for PDC020A. L : select
24	P14	XTALOFF	O	L	XTAL on : L. OFF : H
25	P13	XEMP	O	H	Emphasis controlling. L : Deemphasis
26	P12	XRST	O	L	ATIP decoder reset output for mechanical controller
27	P11	-	O	L	Not used.
28	P10	PRIM	I	-	Parallel remote controller key SW input (A/D input)
29	AVDD	VDD	-	-	Connected to VDD.
30	AVREF	VDD	-	-	Connected to VDD.
31	P04	SLCT—SW	I	-	Not used.
32	XT2	-	O	-	Not used.
33	VSS	GND	-	-	Connected to GND.
34	X1	-	I	-	Oscillator for system. 4.19MHz
35	X2	-	O	-	
36	P37	—PREQ	O	-	Not used.
37	P36	DIN—SEL	I	-	Not used.
38	P35	RMCN—SW	I	-	DIP SW2 (Infra-red remote controller operation prohibit SW) H : PROHIBIT
39	P34	CP—BIR1P	I	-	DIP SW3 (Copy Bit select SW 1)
40	P33	CP—BIT0P	I	-	DIP SW4 (Copy Bit select SW 0)
41	P32	MACK	O	H	Communication reply for mechanical controller
42	P31	LREQ	O	H	LC89585 CE signal
43	P30	UNLOCK	I	-	Detecting digitally unlock condition.
44	INTP3	DIGOUT	I	-	Digital output ON/OFF. H : ON
45	INTP2	XPFAIL	I	-	Detecting power down. L : Power down
46	INTP1	MREQ	I	-	mechnical controller communication request (interruption)
47	INTP0	REMIN	I	-	Remote controller input (interruption)
48	IC	VPP	I	-	Connected to GND.
49	P72	LED2	O	L	Not used.
50	P71	LED1	O	L	REC indicator LED. L : ON
51	P70	LED0	O	L	Manual track increment permission. L : ON
52	VDD	VDD	-	-	Connected to VDD.
53	P127	SCAN4	O	L	Key matrix output 4
54	P126	SCAN3	O	L	Key matrix output 3
55	P125	SCAN2	O	L	Key matrix output 2
56	P124	SCAN1	O	L	Key matrix output 1
57	P123	SCAN0	O	L	Key matrix output 0
58	P122	KEYIN3	I	-	Key matrix input 3
59	P121	KEYIN2	I	-	Key matrix input 2
60	P120	KEYIN1	I	-	Key matrix input 1
61	P117	KEYIN0	I	-	Key matrix input 0 (Used as test mode SW as well)
62	P116	-	O	L	Not used.
63	P115	-	O	L	Not used.
64	P114	-	O	L	Not used.

No.	Symbol	Terminal Description	I/O	Initial Voltage	Function
65	P113	SEG10	O	L	FL segment output 10
66	P112	SEG 9	O	L	FL segment output 9
67	P111	SEG 8	O	L	FL segment output 8
68	P110	SEG 7	O	L	FL segment output 7
69	P107	SEG 6	O	L	FL segment output 6
670	P106	SEG 5	O	L	FL segment output 5
71	VLOAD	VLOAD	-	-	VLOAD
72	P105	SEG 4	O	L	FL segment output 4
73	P104	SEG 3	O	L	FL segment output 3
74	P103	SEG 2	O	L	FL segment output 2
75	P102	SEG 1	O	L	FL segment output 1
76	P101	SEG 0	O	L	FL segment output 0
77	P100	GRID 10	O	L	FL grid output 10
78	FIP9	GRID 9	O	L	FL grid output 9
79	FIP8	GRID 8	O	L	FL grid output 8
80	FIP7	GRID 7	O	L	FL grid output 7

● LC89585 (IC301) on the AUDIO DIGITAL BOARD ASSY

(1) Block Diagram



(2) Function of Terminal

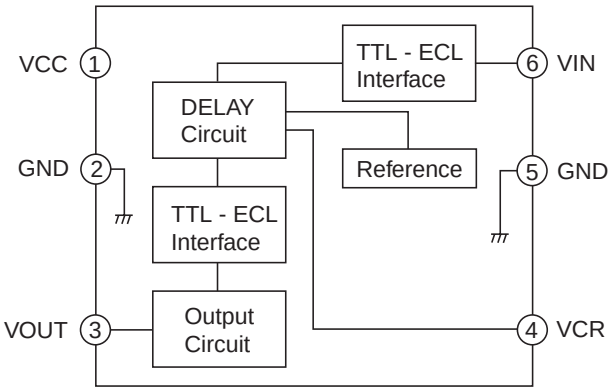
No.	Terminal Description	I/O	Function
1	DIN 1	I	Optical module reply data input
2	DIN 2	I	Optical module reply data input
3	DIN 3	I	Optical module reply data input
4	DIN 4	I	Optical module reply data input
5	DIRRC 1	I	RC oscillation input
6	DIRRC 2	O	RC oscillation output
7	AVDD	-	Analog power supply voltage
8	DIRRS	I	VCO oscillation bandwidth adjusting input
9	AGND	-	Analog GND
10	DIRVCO	I	VCO free-run oscillation setting input
11	DIRCK	O	PLL low-pass filter
12	VSS	-	GND
13	VDD	-	+5V power supply voltage
14	DIRCK	O	DIR system clock output
15	DIRBCK	O	DIR bit clock output
16	DIRLRCK	O	DIR LR clock output
17	DIRDATA	O	DIR retrieve data output
18	DIRWDCK	O	DIR word clock output
19	DIRU	O	User Bit output
20	DIRERR	O	Data error/lock condition monitor output. H : UNLOCK. L : LOCK
21	DRAMSW	O	External DRAM capacity setting output. H : 4MBit. L : 1MBit
22	CJSDATA	I	Clock jitter restrain data input
23	CJSBCK	I	Clock jitter restrain bit clock input
24	CJSLRCK	I	Clock jitter restrain LR clock input
25	JITVCOIN	I	VCO input
26	JITLPFO	O	LPF output
27	JITLPFI	I	LPF input
28	JITPCO	O	Phase comparison output
29	JITERR	O	Lock conditin monitoring output. H : UNLOCK. L : LOCK
30	DACDATA	O	DAC data output
31	DACBCK	O	DAC bit clock output
32	DACLRCK	O	IDAC LR clock output
33	ADCDATA	I	ADC recording data input
34	ADCCLK	O	ADC clock output
35	ADCBCK	O	ADC bit clock output
36	ADCLRCK	O	ADC LR clock output
37	ADCSTBY	O	ADC standby signal output. H : Operating. L : Standby
38	XTALIN	I	System clock input
39	XTALOUT	O	System clock output
40	VSS	-	GND

No.	Terminal Description	I/O	Function
41	VDD	-	+5V power suply voltage
42	DACCKOUT	O	DAC system clock output
43	ENCCKOUT	O	CD decoder system clock output
44	CDDATA	I	CD decoder data input
45	CDBCK	I	CD decoder bit clock input
46	CDLRCK	I	CD decoder LR clock input
47	CDTX	I	Input signal from CD decoder output
48	DITOUT	O	2 phase modulation output
49	TP6	I	For testing
50	XRESET	I	System reset input. L : Rest
51	TP7	I	For testing
52	XCAS	O	DRAM load address strobe signal output
53	XOE	O	DRAM output enable signal output
54	A8	O	DRAM address output
55	A7	O	
56	A6	O	
57	A5	O	
58	A4	O	
59	A3	O	
60	A2	O	
61	VDD	-	+5V power suply voltage
62	VSS	-	GND
63	A1	O	DRAM address output
64	A0	O	
65	A9	O	
66	XRAS	O	DRAM column address strobe signal output
67	XWR	O	DRAM read/write signal output
68	DQ2	I/O	DRAM data input/output
69	DQ1	I/O	
70	DQ4	I/O	
71	DQ3	I/O	
72	TP0	I	For testing
73	TP1	I	
74	TP2	I	
75	TP3	I	
76	ENCVCOIN	I	Clock input for encode circuit
77	ENCLPFO	O	LPF output
78	ENCLPFI	I	LPF input
79	ENCPCO	O	Phase comparison output
80	ENCERR	O	Lock condition monitoring signal output. H : UNLOCK. L : LOCK

No.	Terminal Description	I/O	Function
81	TP4	O	For testing
82	TP5	I	
83	XRFDET	I	RF detection signal input. H : No RF. L : RF exists.
84	RECEN	I	REC enable signal input. H : REC enabled. L : REC disabled.
85	TP8	O	Test terminal
86	DET4T	O	4T detection signal output
87	DET3T	O	3T detection signal output
88	EFM	O	EFM signal output
89	VDD	-	+5V power supply voltage
90	VSS	-	GND
91	ENCCK	O	Encode clock output
92	XEXTACK	O	ATIP sync notifying signal output
93	XEXTSYNC	I	ATIP sync enable signal inut
94	ATIPSYNC	I	ATIP sync signal input
95	SUBSYNC	O	Subcode sync signal output
96	CCB	I	CPU interface method selecting signal input. H : Sanyo CCB format. L : Common serial format
97	CE	I	CPU interface chip enable signal input
98	CL	I	CPU interface data transfer clock input
99	DI	I	CPU interface data input
100	DO	O	CPU interface data output

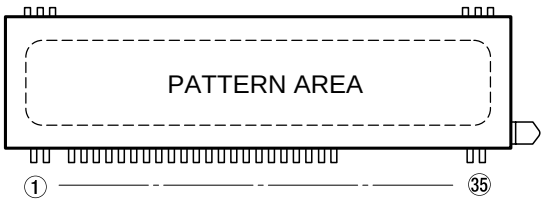
● TK16124M (IC333, 334, 340) on the STRATEGY BOARD ASSY

(1) Block Diagram



● PEL1086 (V701) on the FUNCTION BOARD ASSY

FL INDICATOR TUBE



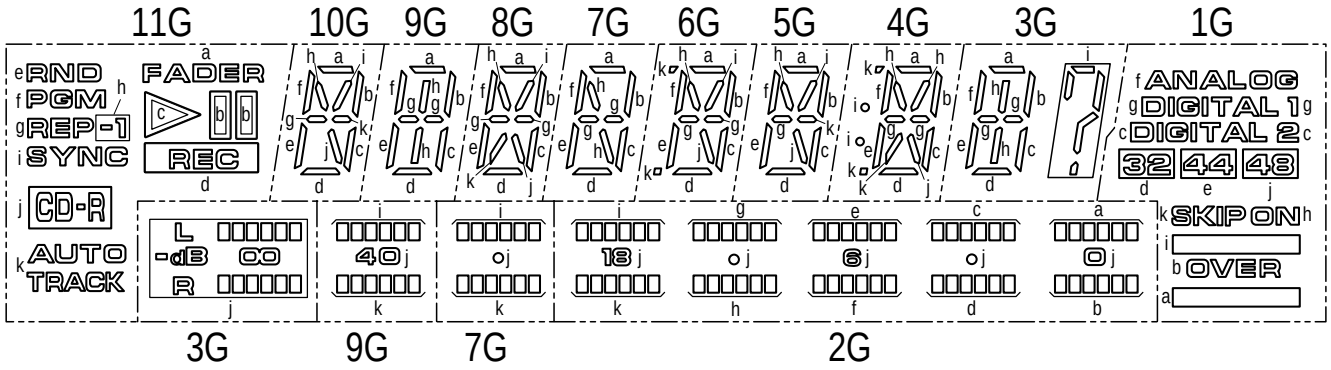
Pin Connection

Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Connection	F1	F1	NP	P a	P b	P c	P d	P e	P f	P g	P h	P i	P j	P k	11G	10G	9G

Pin No.	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Connection	8G	7G	6G	5G	4G	3G	2G	1G	NP	NP	NP	NP	NP	NP	NP	NP	F2	F2

NOTES : 1) F : Filament 2) G : Grid 3) P : Anode 4) NP : No Pin

Grid Assignment



Anode Connection

	11G	10G	9G	8G	7G	6G	5G	4G	3G	2G	1G
a	FADER	a	a	a	a	a	a	a	a	a	
b	▯▯	b	b	b	b	b	b	b	b	b	OVER
c	▷	c	c	c	c	c	c	c	c	c	DIGITAL 2
d	REC	d	d	d	d	d	d	d	d	d	32
e	RND	e	e	e	e	e	e	e	e	e	44
f	PGM	f	f	f	f	f	f	f	f	f	ANALOG
g	REP	g	g	g	g	g	g	g	g	g	DIGITAL 1
h	-1	h	h	h	h	h	h	h	h	h	ON
i	SYNC	i	i	i	i	i	i	i	i	i	
j	CD-R	j	j	j	j	j	j	j	j	j	48
k	AUTO TRACK		k	k	k	k	k	k		k	SKIP

5.3 DISASSEMBLING

(1) REMOVE THE TRAY PANEL

Hold the tray panel with your hands as shown in Fig. 1, and grasp the tray with your thumbs and then lift the tray panel up while pulling it toward you with the other fingers. (Fig. 2)

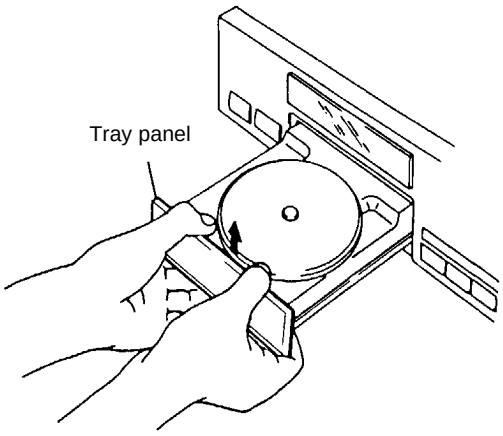


Fig. 1

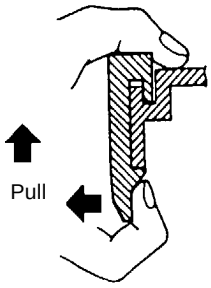


Fig. 2

(2) INSTALL THE TRAY PANEL

Align the tray panel with the grooves located at both edges of the tray. And then press it down till it stops. (Fig. 3)

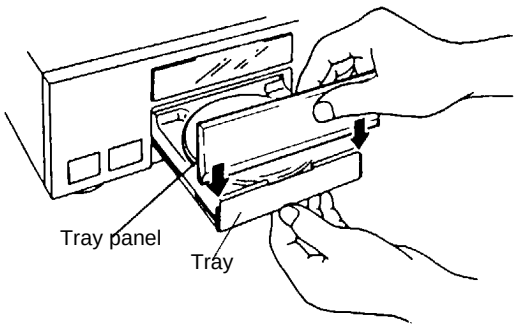


Fig. 3

(3) REMOVE AND SET UP THE HEAD BOARD ASSY

1. Remove the rack mount angle L, R and bonnet.
2. Remove the tray panel (Refer to section 1).
3. Remove the five screws of the front panel and remove a screw of HEADPHONE BOARD ASSY.
4. Remove the under panel to sliding it towards the right.

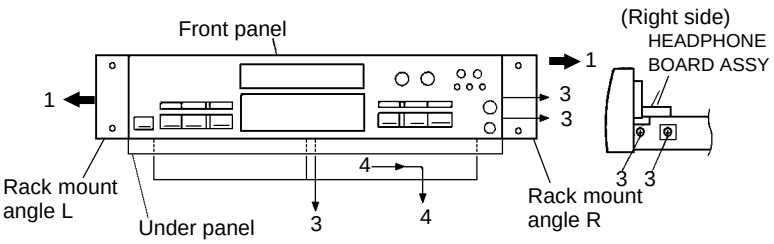


Fig. 4

5. Pull out the right side of the front panel to the front and remove the four screws of the board.

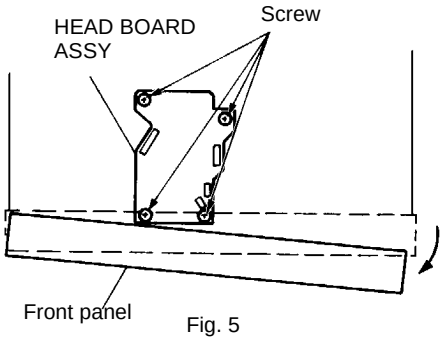


Fig. 5

6. Remove the fixtures of the wires connected to the board (cord holder, PCB binder).
7. Place the HEAD BOARD ASSY upright against the slit of the float base.

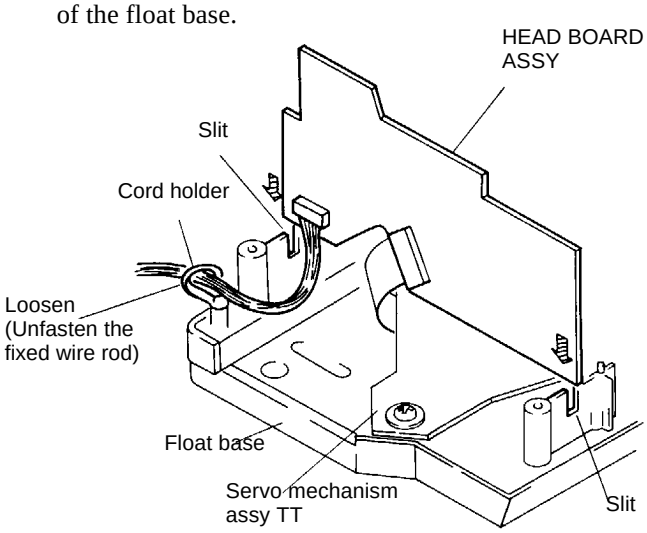
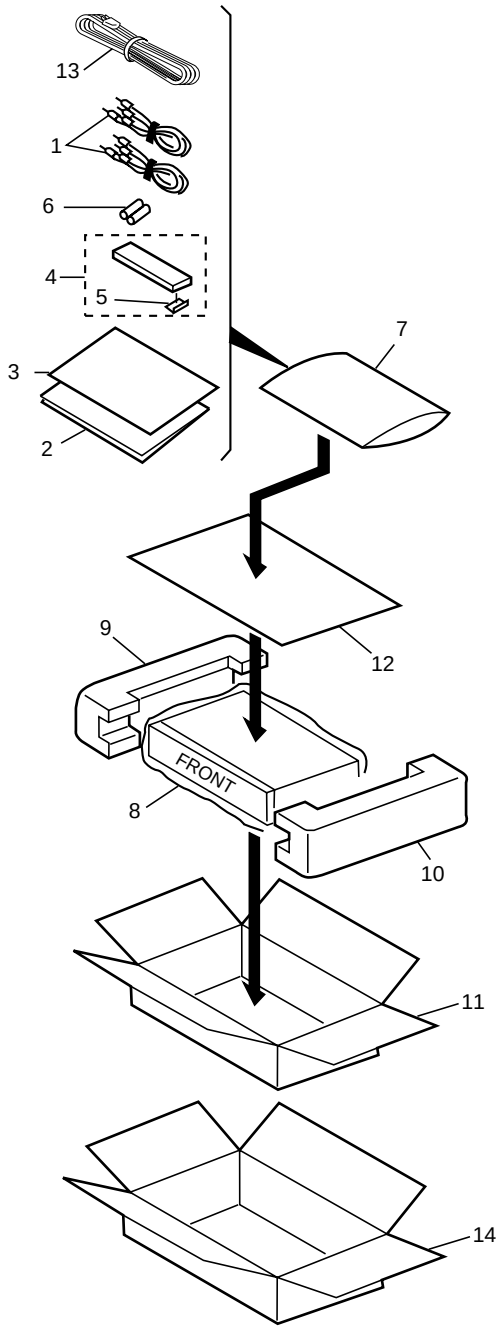


Fig. 6

6. EXPLODED VIEWS AND PARTS LIST

NOTES:
• Parts marked by "NSP" are generally unavailable because they are not in our Master Spare Parts List.
• The ⚠ mark found on some component parts indicates the importance of the safety factor of the part.
Therefore, when replacing, be sure to use parts of identical designation.
• Screws adjacent to ▼ mark on the product are used for disassembly.

6.1 PACKING



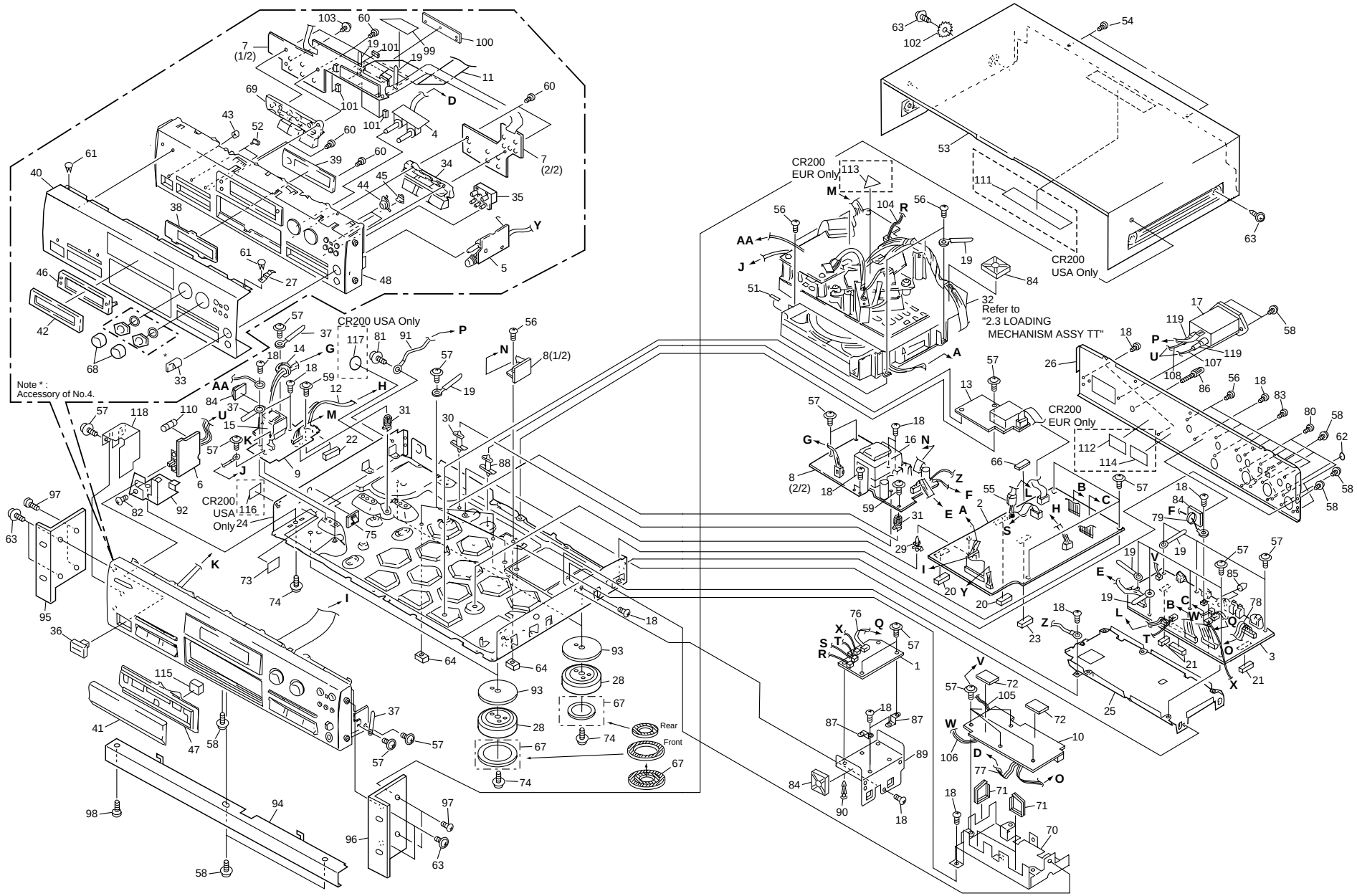
(1) PARTS LIST

Mark	No.	Description	Part No.
	1	Audio cable (L : 1.2m)	8276 9120 00
	2	Owner's manual, CR200, ENG	8288 4070 00
NSP	3	Caution	
	4	Remote Control Unit	8270 8290 00
NSP	5	Battery Cover	
NSP	6	Dry Cell Battery (R03,AAA)	
NSP	7	Polyethylene Bag	
NSP	8	Sheet	
	9	Packing, L, CR200	8228 4430 00
	10	Packing, R, CR200	8228 4440 00
	11	Carton, inner, CR200	8228 7180 00
NSP	12	Top Plate	
⚠	13	AC Power Cord, USA	8276 9100 00
		AC power cord, EUR	8276 9110 00
	14	Carton, outer, CR200	8228 8970 00

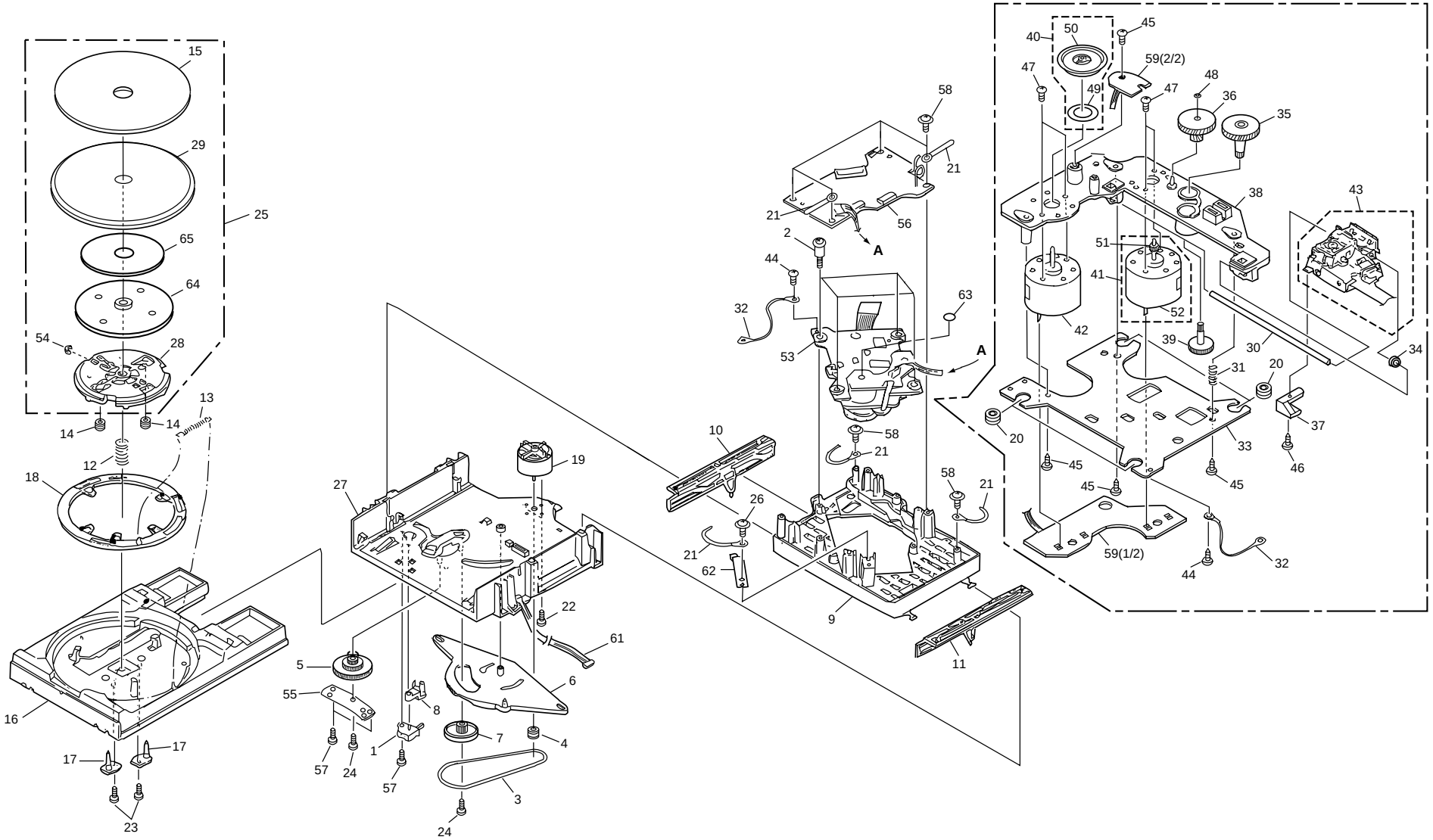
(1) PARTS LIST

Mark	No.	Description	Part No.
	1	Strategy Board assy	8274 1430 00
	2	Servo Ucom Board assy	8274 1440 00
	3	Audio Digital Board assy	8274 1450 00
	4	REC VR Board assy	8274 1460 00
	5	Headphone Board aSSY	8274 1470 00
	6	Power SW Board assy, USA	8274 1480 00
		Power SW Board assy, EUR	8274 1490 00
	7	Function Board assy	8274 1500 00
	8	Power A Board assy	8274 1510 00
	9	Power B Board assy, USA	8274 1520 00
		Power B Board assy, EUR	8274 1530 00
	10	Balance Input Board assy	8274 1540 00
	11	Cable assy, 39P, FFC/30V	8277 4570 00
	12	Cable assy, 5P	8277 4580 00
	13	Parallel Remote Board assy	8274 1550 00
	14	Core, ferrite	8223 2990 00
⚠	15	Transformer, power, servo, USA	8242 2510 00
		Transformer, power, servo, EUR	8242 2520 00
⚠	16	Transformer, power, audio, USA	8242 2530 00
		Transformer, power, audio, USA	8242 2540 00
⚠	17	Inlet, AC with line filter	8245 3150 00
	18	Screw, 3 x 6, B	8204 1580 00
	19	Cord clamper	8221 1140 00
NSP	20	Cushion (3.5)	
NSP	21	Spacer A	
	22	Spacer, rubber, A	8216 6760 00
	23	Spacer, rubber, B	8216 6770 00
NSP	24	Under Base	
	25	Chassis, audio board	8221 2410 00
	26	Panel, rear, USA	8221 2420 00
		Panel, rear, EUR	8221 2430 00
	27	Plate, earth	8221 2440 00
	28	Insulator	8212 6360 00
NSP	29	Holder, PCB	
	30	Holder, PCB, B	8212 6370 00
NSP	31	PCB Spacer	
NSP	32	Loading Mechanism assy TT	
	33	Knob, headphone	8226 2400 00
	34	Button, operation, R	8226 2410 00
	35	Button, REC	8226 2420 00
	36	Button, power	8226 2430 00
NSP	37	Cord Clamper	
	38	Display Window	8212 6380 00
	39	FL Sheet	8216 6700 00
	40	Panel, front	8221 2450 00
	41	Panel, tray	8221 2460 00
	42	Panel, display, 7	8221 2470 00
	43	Lens, LED	8212 6390 00
	44	Ring, REC	8212 6400 00
	45	Lens, REC	8212 6410 00
	46	Holder	8212 6420 00
	47	Holder, tray	8212 6430 00
	48	Panel, control	8212 6440 00
	49	¥ ¥ ¥ ¥ ¥	
	50	¥ ¥ ¥ ¥ ¥	
	51	Label, caution	8218 7670 00
	52	Lens, indicator	8212 6450 00
	53	Bonnet	8221 2480 00
	54	Screw, BBT30P080FCC	8204 1590 00
	55	Core, ferrite	8223 2980 00
	56	Screw, BBZ30P080FCC	8214 3790 00
	57	Screw, IBZ30P060FCC	8214 2980 00
	58	Screw, IBZ30P080FCC	8214 2990 00
	59	Screw, IBZ30P150FCC	8214 3800 00
	60	Screw, PPZ30P150FMC	8214 3810 00
	61	Rivet	8207 0127 00
	62	Label, black	8218 7680 00
	63	Screw, ABZ40P080FZK	8204 1600 00
	64	Disc Guard	8216 6780 00
	65	¥ ¥ ¥ ¥ ¥	
	66	IC, EEPROM	8236 0841 00
	67	Stopper	8216 6790 00
	68	Knob, VR	8226 2440 00
	69	Button, operation, L	8226 2450 00
	70	Chassis, balance	8221 2490 00
	71	Edge Saddle	8212 6470 00
NSP	72	Spacer	
NSP	73	Sheet	
	74	Screw, IBZ30P100FCC	8214 3850 00
NSP	75	Wire Clamp	
	76	Connector Assy, 4P	8277 4590 00
	77	Connector Assy, 9P	8277 4600 00
	78	Connector Assy, 9P	8277 4610 00
NSP	79	Binder	
	80	Screw, PMZ30P060FCC	8204 1610 00
	81	Screw, AMZ40P060FCU	8204 1620 00
	82	Screw, PMA30P060FCU	8204 1630 00
	83	Screw, PMZ26P040FMC	8204 1640 00
NSP	84	Binder Holder	
NSP	85	Cap	
	86	Terminal Screw, SI-A2475	8245 3160 00
NSP	87	PCB Base	
NSP	88	PC Support	
	89	Chassis, STG	8221 2500 00
NSP	90	Locking Card Spacer	
NSP	91	Earth Lead	
	92	Chassis, SW	8221 2510 00
	93	Spacer	8212 6460 00
	94	Panel, under	8221 2520 00
	95	Angle, rack mount, L	8221 2530 00
	96	Angle, rack mount, R	8221 2540 00
	97	Screw, BBZ40P160FZK	8204 1650 00
	98	Screw, 3 x 8, B	8204 1660 00
	99	Sheet, shield	8221 2550 00
	100	FL Shield	8221 2560 00
NSP	101	FL Spacer	
	102	Washer	8204 1670 00
	103	Screw, IPZ30P080FMC	8204 1680 00
	104	Connector Assy, 2P	8277 4620 00
	105	Connector Assy, 3P	8277 4630 00
	106	Connector Assy, 4P	8277 4640 00
NSP	107	Jumper Wire	
NSP	108	Jumper Wire	
	109	¥ ¥ ¥ ¥ ¥	
⚠	110	Fuse, 1A/125V, USA	8239 1180 00
		Fuse, T500mA/250V, EUR	8239 1190 00
NSP	111	65 Label	
	112	Caution label, EUR	8218 7640 00
	113	Caution label, G, EUR	8218 7650 00
NSP	114	Caution Label (HE)	
	115	Cushion	8216 6810 00
NSP	116	Fuse Caution Label	
	117	Earth Label, EUR	8218 7660 00
NSP	118	Switch Cover	
NSP	119	Connect Sleeve	

6.2 OVERALL EXPLODED VIEW



6.3 LOADING MECHANISM ASSY TT



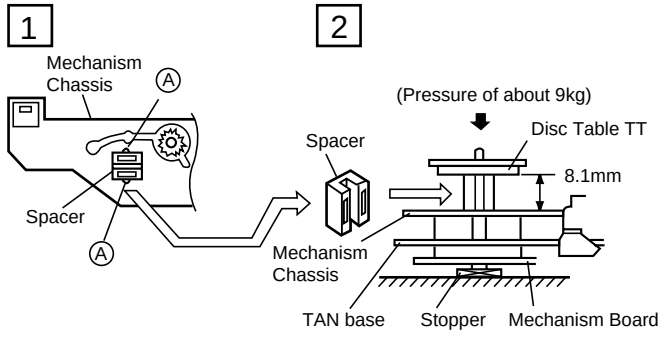
(1) Parts List

Mark	No.	Description	Part No.
	1	Switch, lever	8253 4630 00
	2	Float screw	8214 3740 00
	3	Belt, rubber	8216 6710 00
	4	Pulley, motor	8212 5120 00
	5	Gear, drive	8212 6180 00
	6	Lever, timing	8212 6190 00
	7	Gear, pulley	8212 6200 00
	8	Bracket, SW	8212 6210 00
	9	Base, float	8212 6220 00
	10	Guide, left	8212 6230 00
	11	Guide, right	8212 6240 00
	12	Float spring	8214 3750 00
	13	Lock spring	8214 3760 00
	14	Float rubber	8216 6720 00
	15	Sheet, rubber table	8216 6730 00
	16	Tray	8212 6250 00
	17	Guide, table	8212 6260 00
	18	Plate, lock	8212 6270 00
	19	Motor, DC, 0.75W, loading	8249 0420 00
	20	Float rubber	8216 6740 00
	21	Clamper, cord	8221 1050 00
	22	Screw, BNZ26P040FMC	8214 3820 00
	23	Screw, IPZ26P060FCU	8214 3830 00
	24	Screw, IPZ20P080FMC	8214 3840 00
	25	Turn table assy	8260 5490 00
	26	Screw, IPZ30P080FCU	8214 3860 00
	27	Base, loading	8212 6280 00
	28	Holder, table shaft	8212 6290 00
	29	Turn table	8223 2960 00
	30	Shaft, guide	8223 2970 00
	31	Earth spring	8214 3770 00
NSP	32	Earth lead unit /300V	
	33	Base, TAN	8221 2360 00
	34	Stopper ring	8216 6750 00
	35	Gear 2	8212 6300 00
	36	Gear 3	8212 6310 00
	37	Bracket, TT	8212 6320 00
	38	Chassis, mechanism	8221 2370 00
	39	Gear 1	8212 6330 00
	40	Disc table, TT Assy	8260 5500 00
	41	Carriage motor Assy	8260 5510 00
	42	DC motor assy, spindle	8260 5520 00
	43	Pickup assy	8260 5530 00
	44	Screw, BBZ26P040FMC	8204 1510 00
	45	Screw, BBZ26P080FMC	8204 1520 00
	46	Screw, BBZ20P040FMC	8204 1530 00
	47	Screw, JFZ20P030FNI	8204 1540 00
	48	Washer	8204 1550 00
NSP	49	Mirror Mat	
	50	Disc Table, TT	8212 6340 00
	51	Pinion Gear	8212 6350 00
NSP	52	Motor, DC, spindle, 0.3W	
NSP	53	Servo mechanism assy	
	54	Ring, stop	8212 6480 00
	55	Holder, shaft	8221 2380 00
	56	Head Board assy	8274 1410 00
	57	Screw, BPZ26P060FMC	8204 1560 00
	58	Screw, IBZ30P080FCC	8214 2990 00
	59	Mechanism Board assy	8274 1420 00
	60	¥ ¥ ¥ ¥ ¥	
	61	Connector assy, 5P	8277 4560 00
	62	Spring, clamp	8214 3780 00
	63	Spacer	8204 1570 00
NSP	64	Table Base Assy	
NSP	65	Double Face Tape	

·How to install the disc table

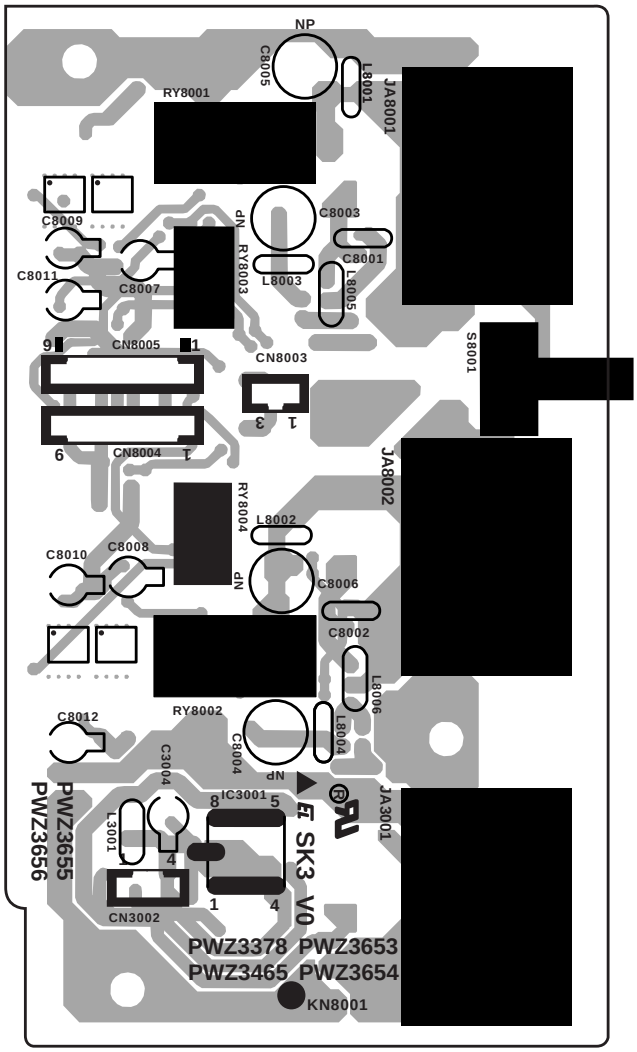
1 Use nippers or other tool to cut the two sections marked Ⓐ in figure 1 . Then remove the spacer.

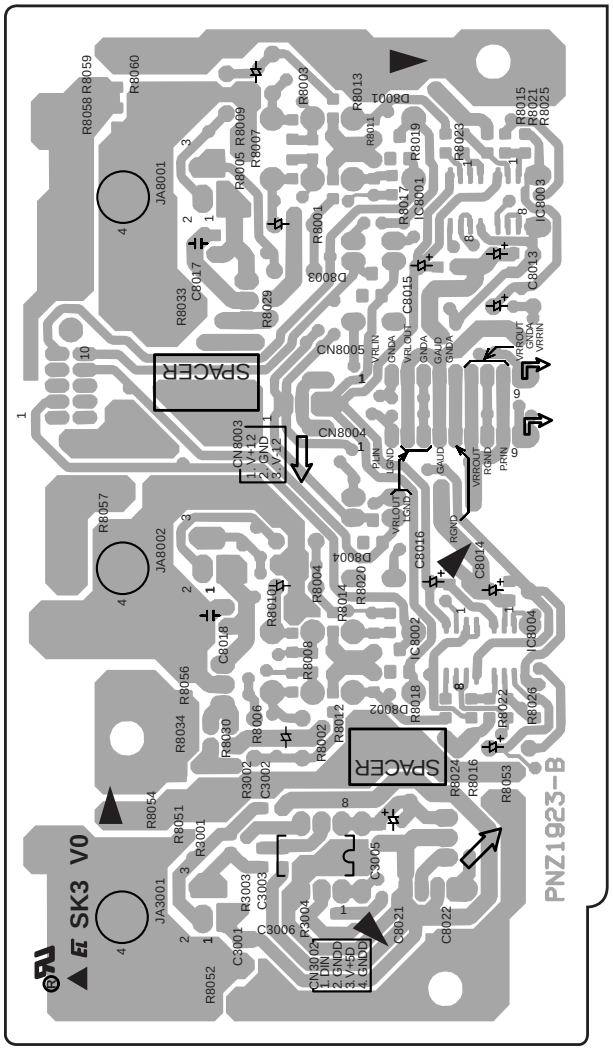
2 While supporting the spindle motor shaft with the stopper, put the spacer on top of the mechanism chassis and stick the disc table TT on top (takes about 9kg pressure). Take off the spacer.

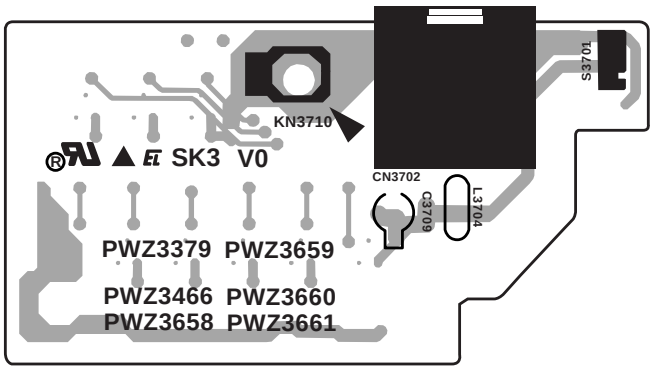


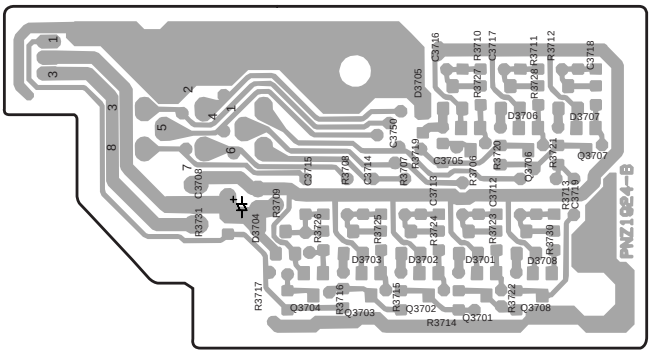
6.4 PCB PATTERN

● Parts & Foil Side of INPUT / PARALLEL REMOTE BOARD ASSYS

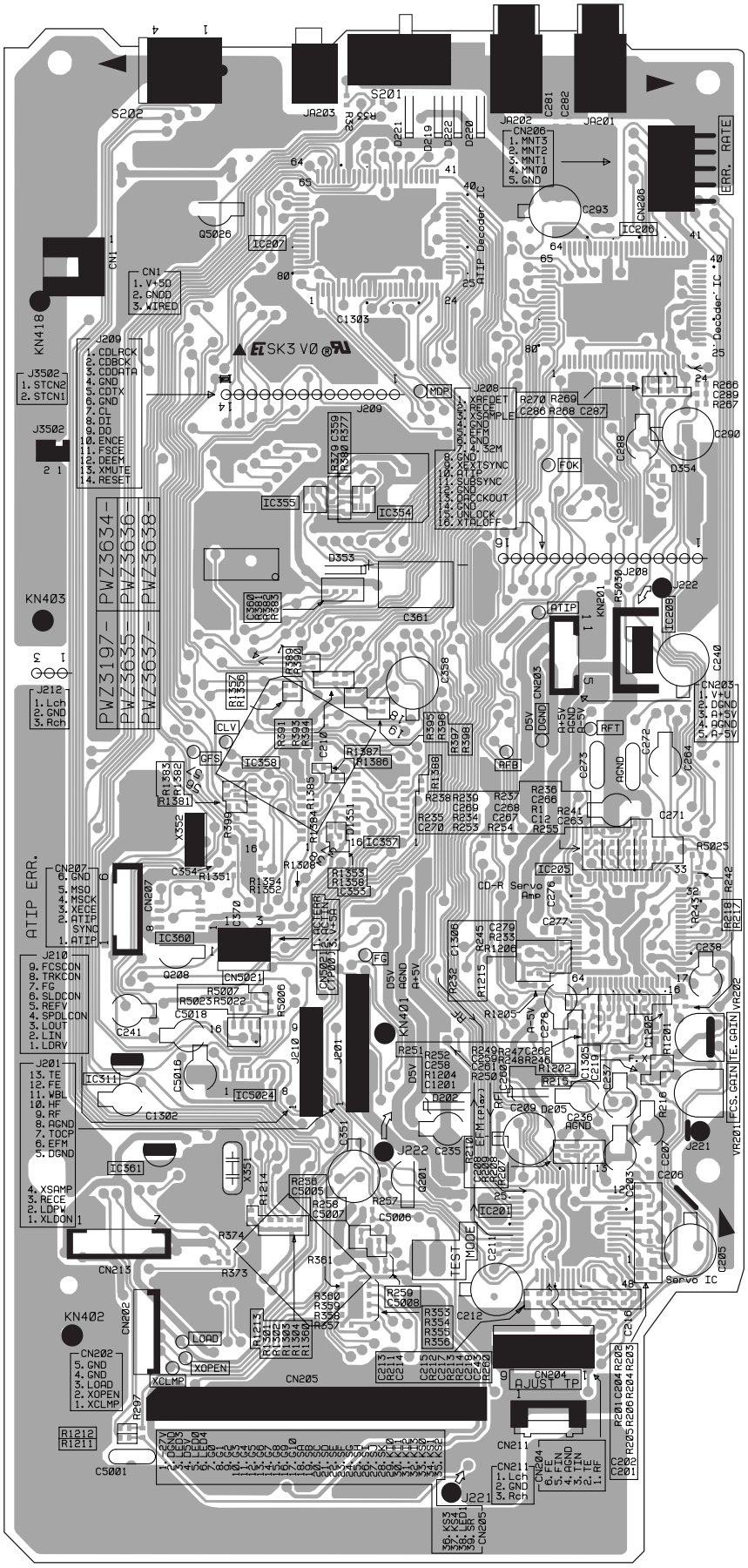




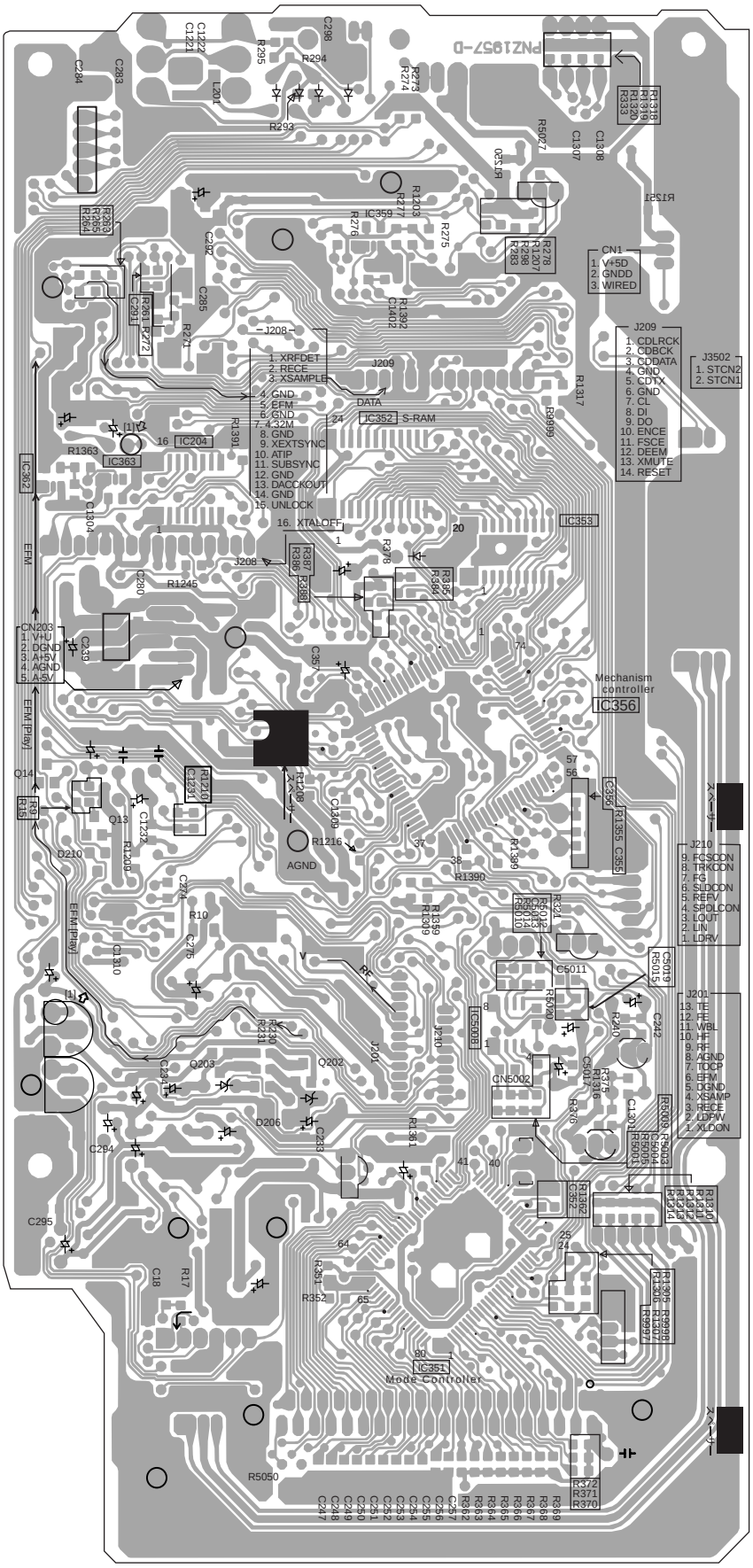




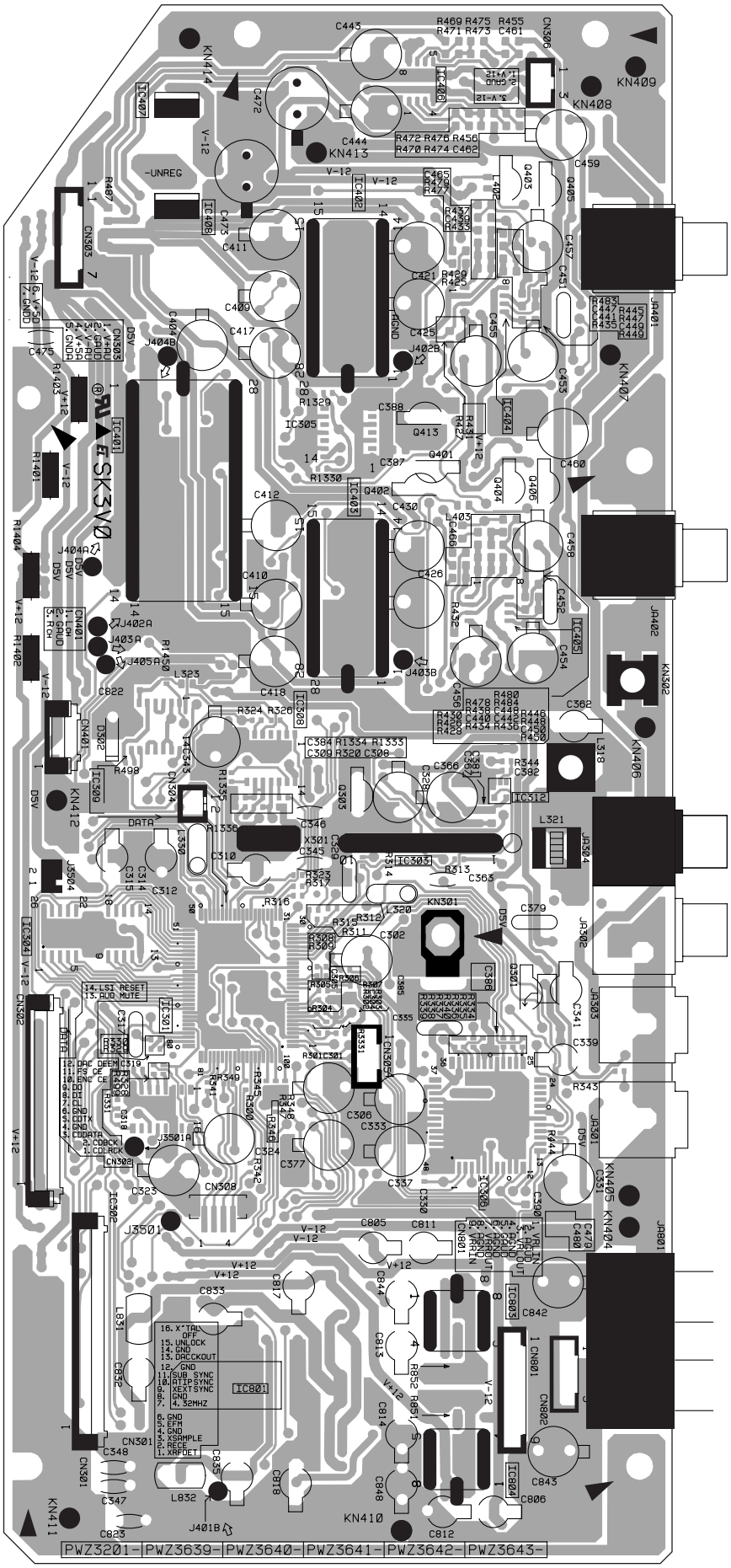
- Parts Side of SERVO UCOM BOARD ASSYS



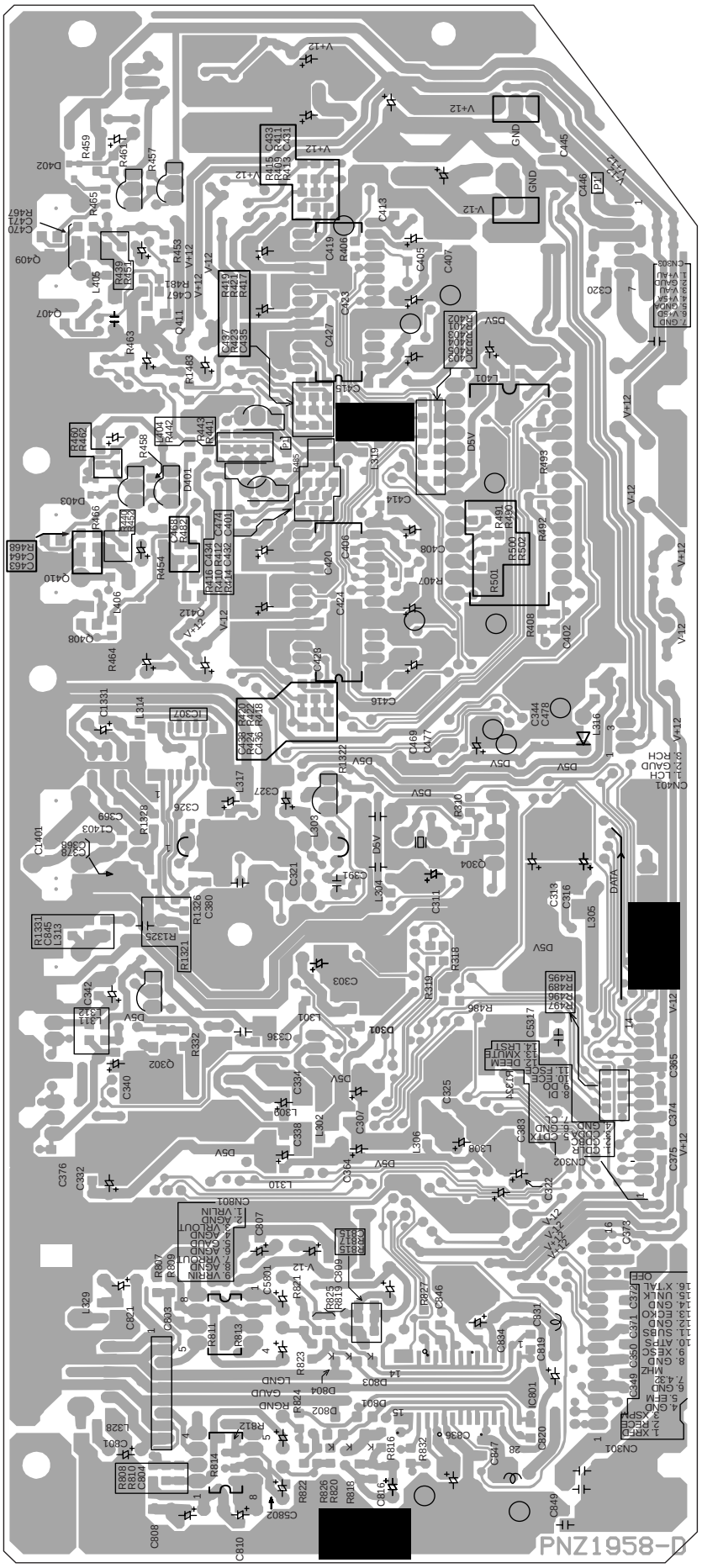
- Foil Side of SERVO UCOM BOARD ASSYS



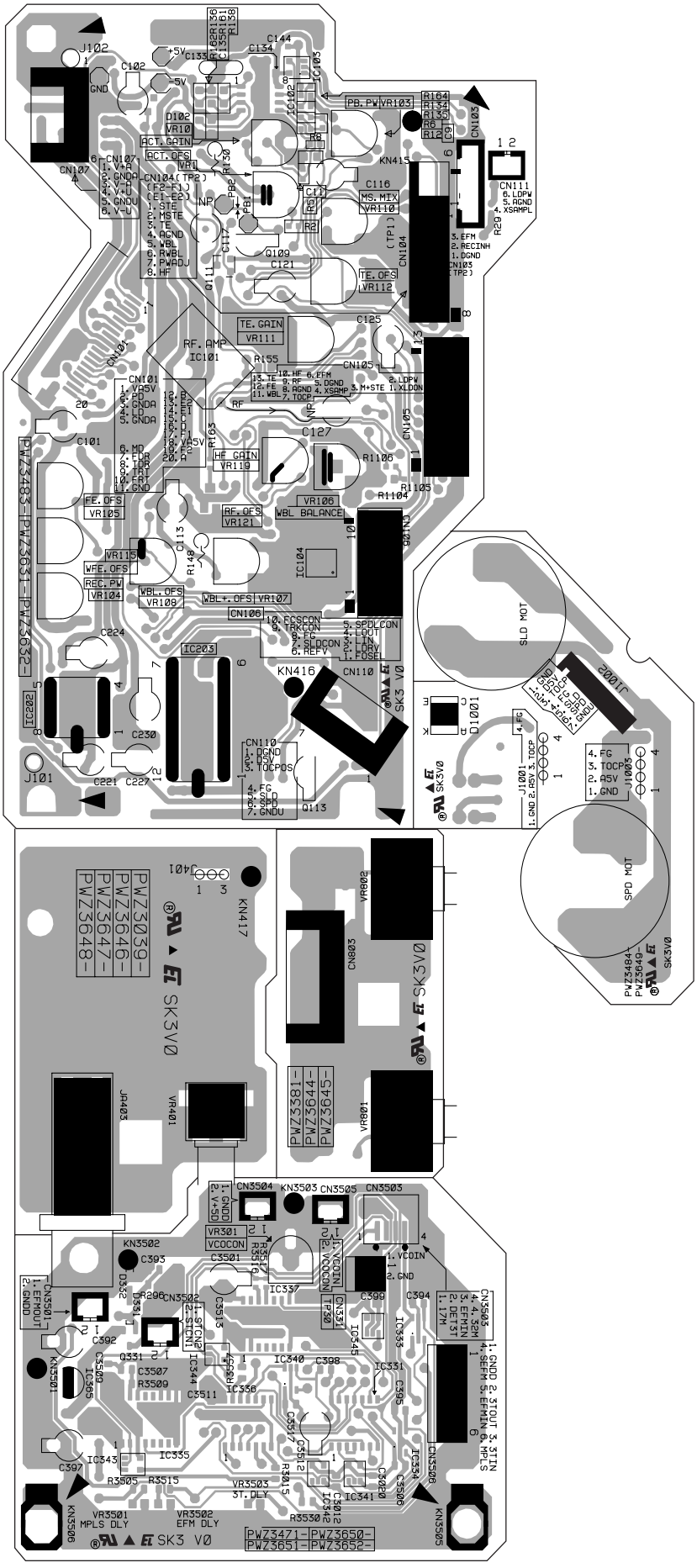
- Parts Side of AUDIO DIGITAL BOARD ASSYS



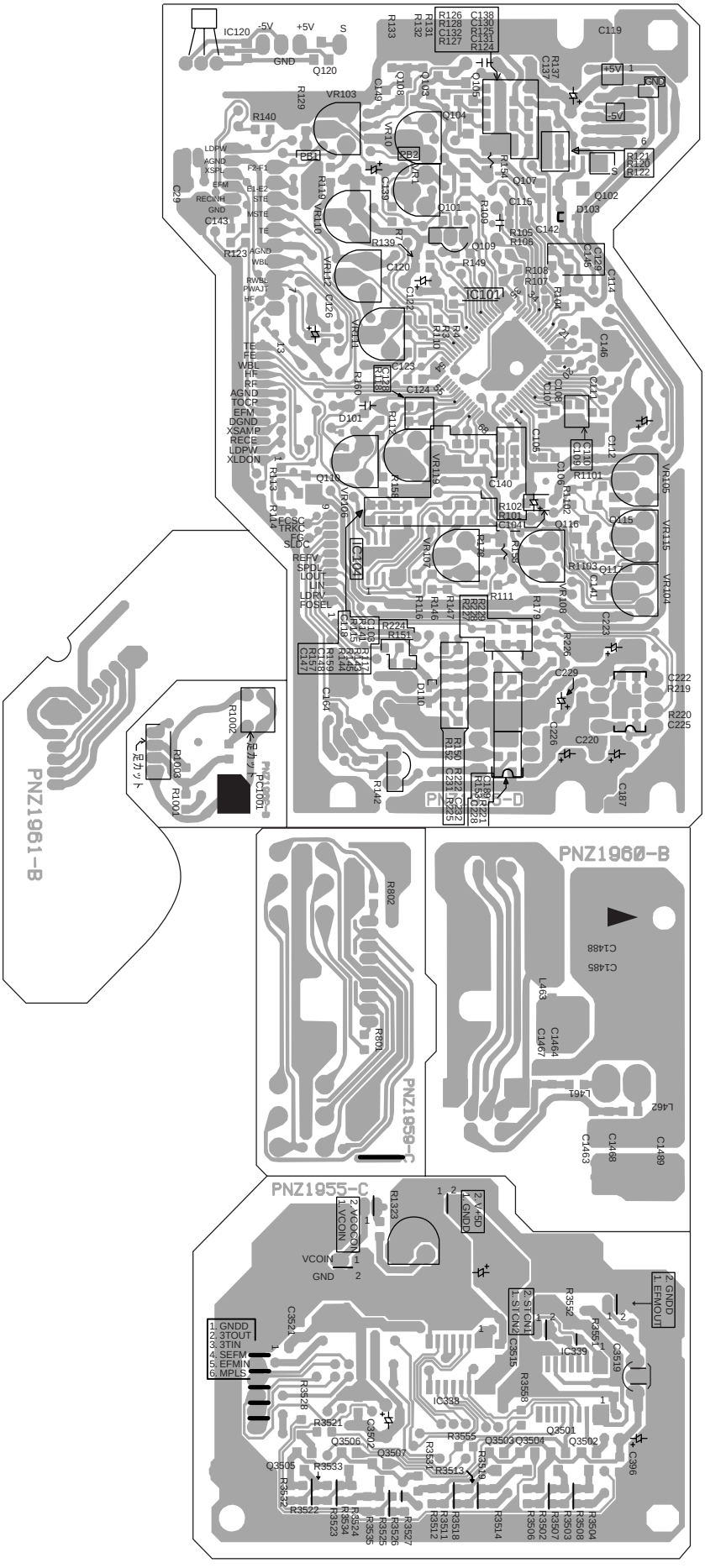
- Foil Side of AUDIO DIGITAL BOARD ASSYS



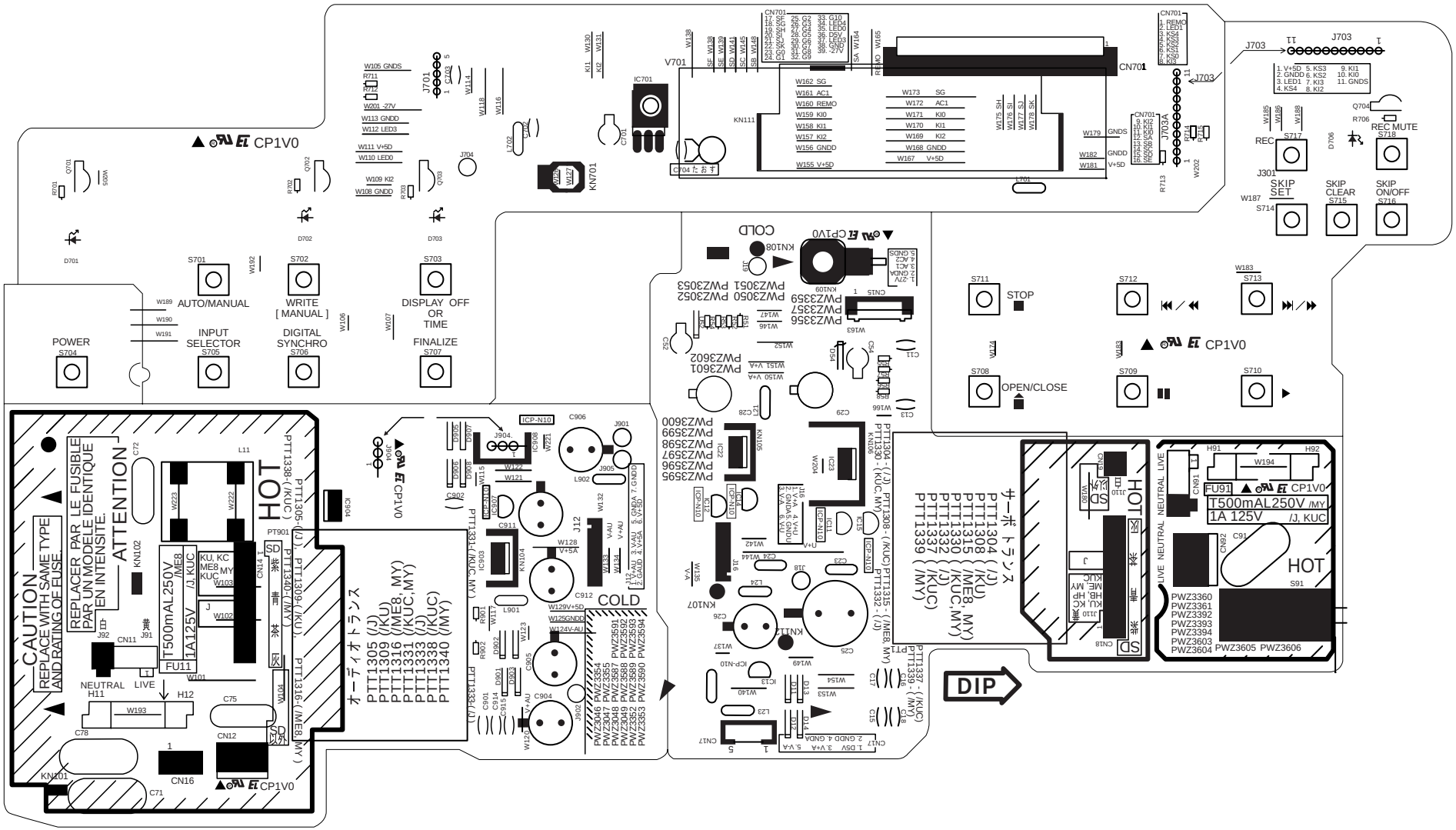
- Parts Side of HEAD / STRATEGY / REC VR / HEADPHONE / MECHANISM BOARD ASSYS



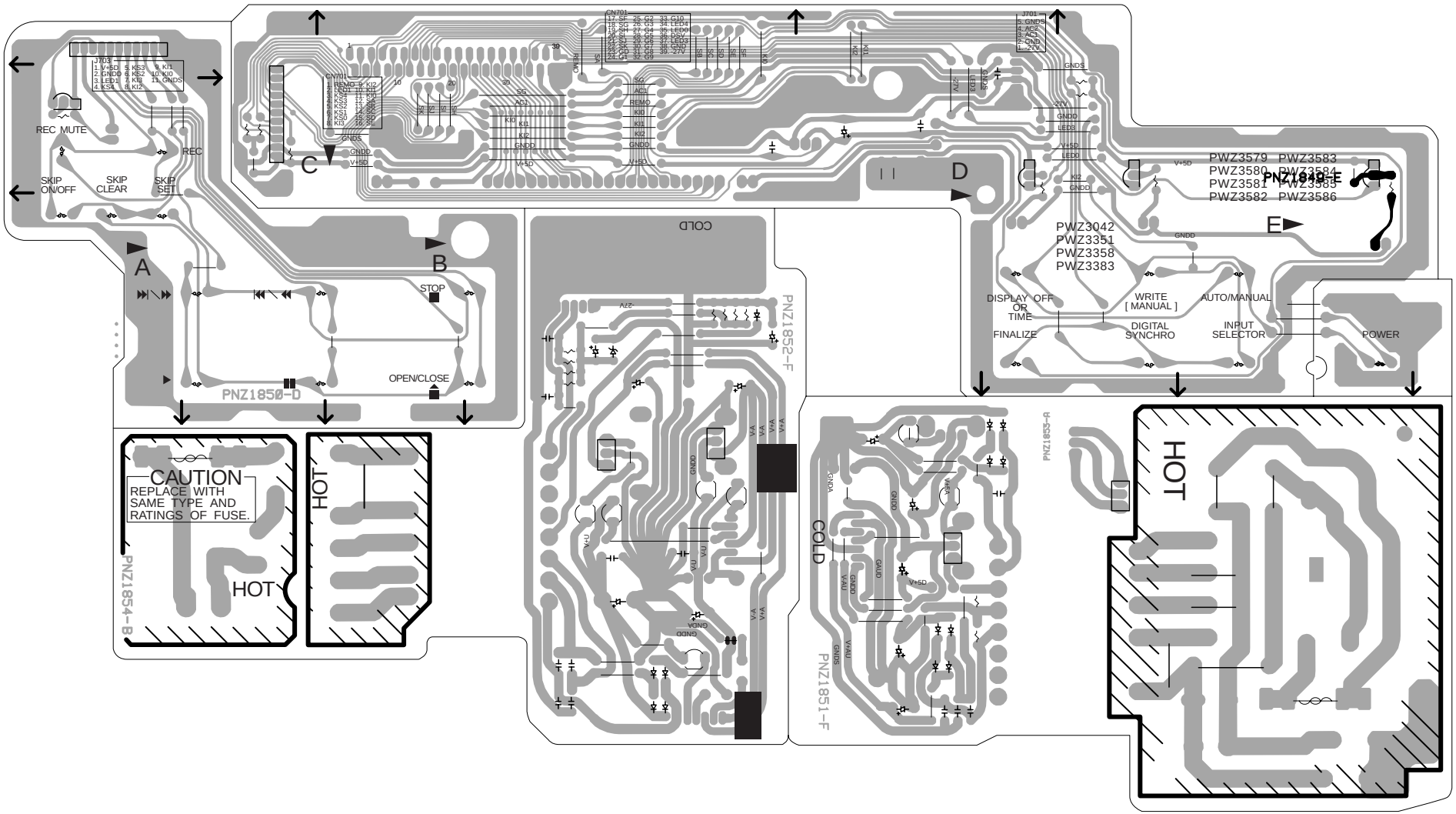
- Foil Side of HEAD / STRATEGY / REC VR / HEADPHONE / MECHANISM BOARD ASSYS



● Parts Side of POWER A & B / FUNCTION / POWER SW BOARD ASSYS

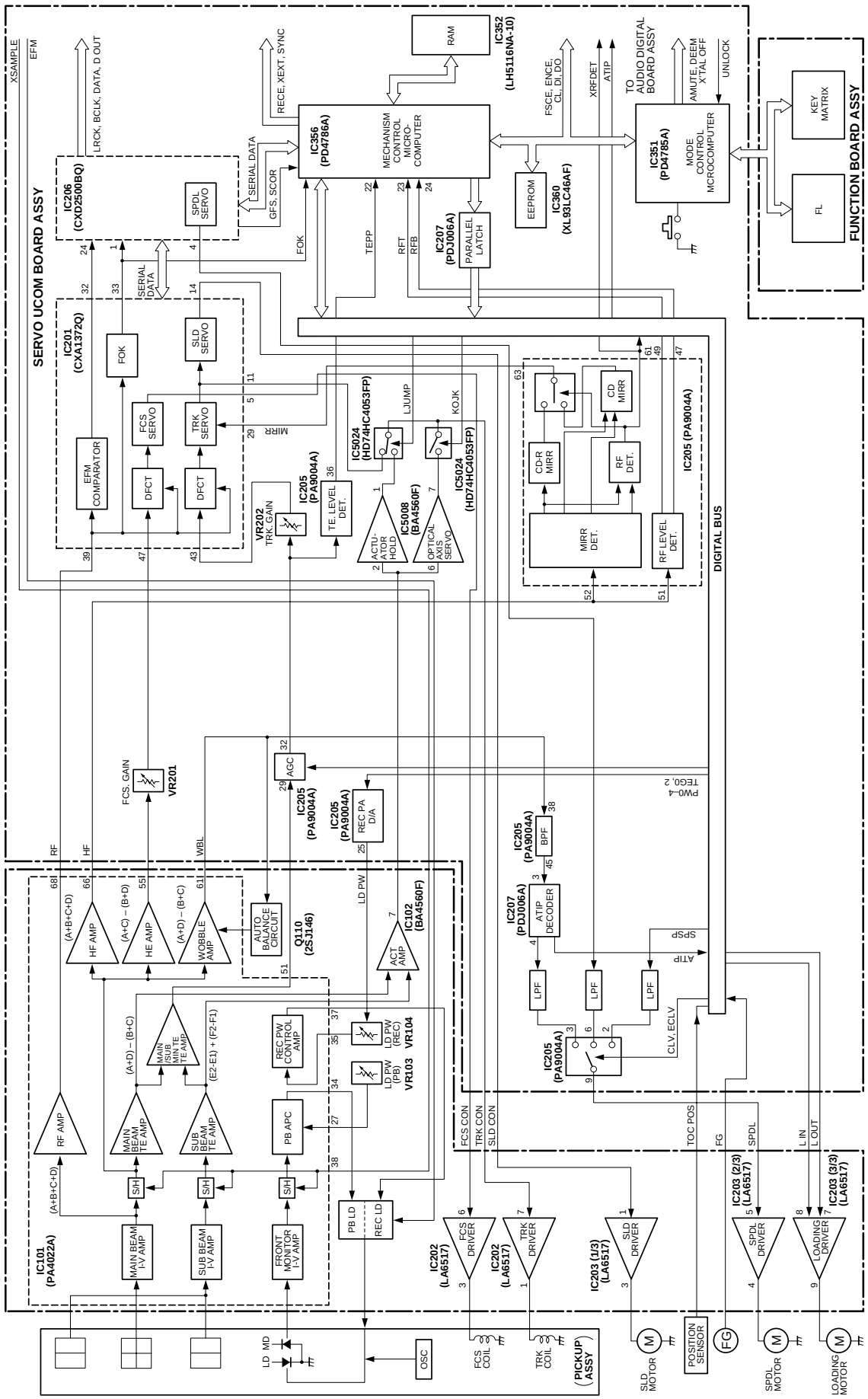


● Foil Side of POWER A & B / FUNCTION / POWER SW BOARD ASSYS

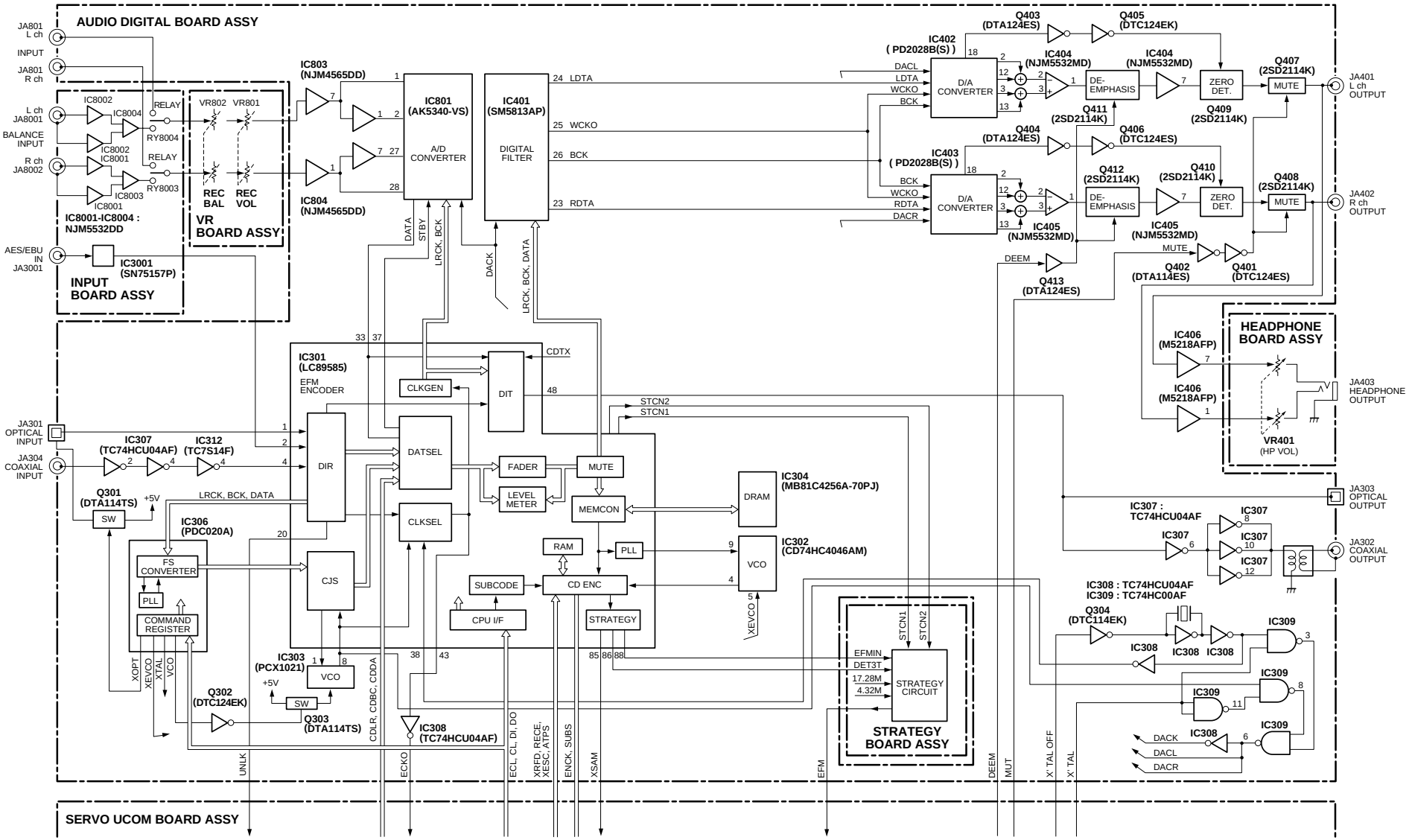


7. BLOCK & CIRCUIT DIAGRAMS

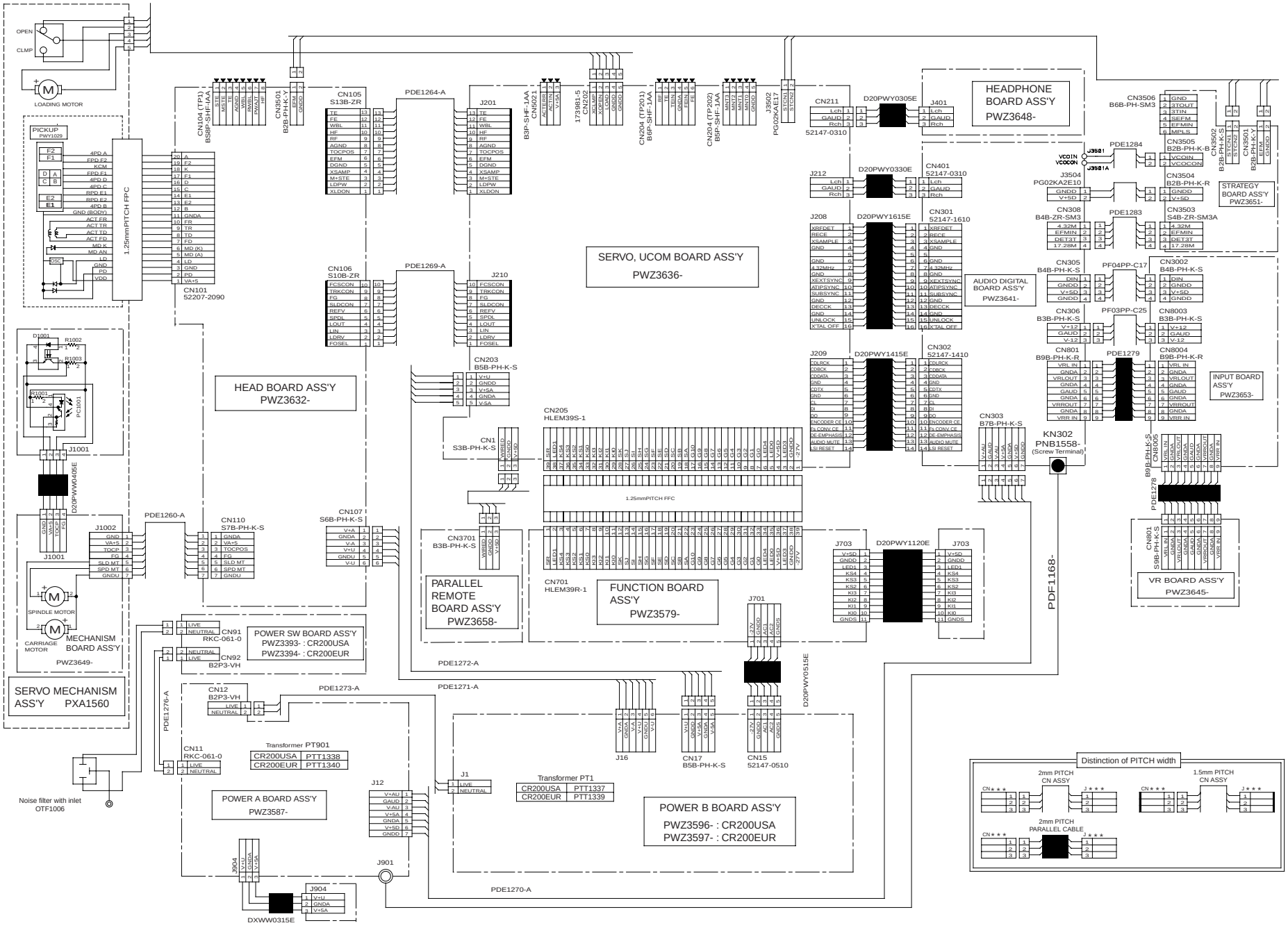
● SERVO SYSTEM BLOCK DIAGRAM



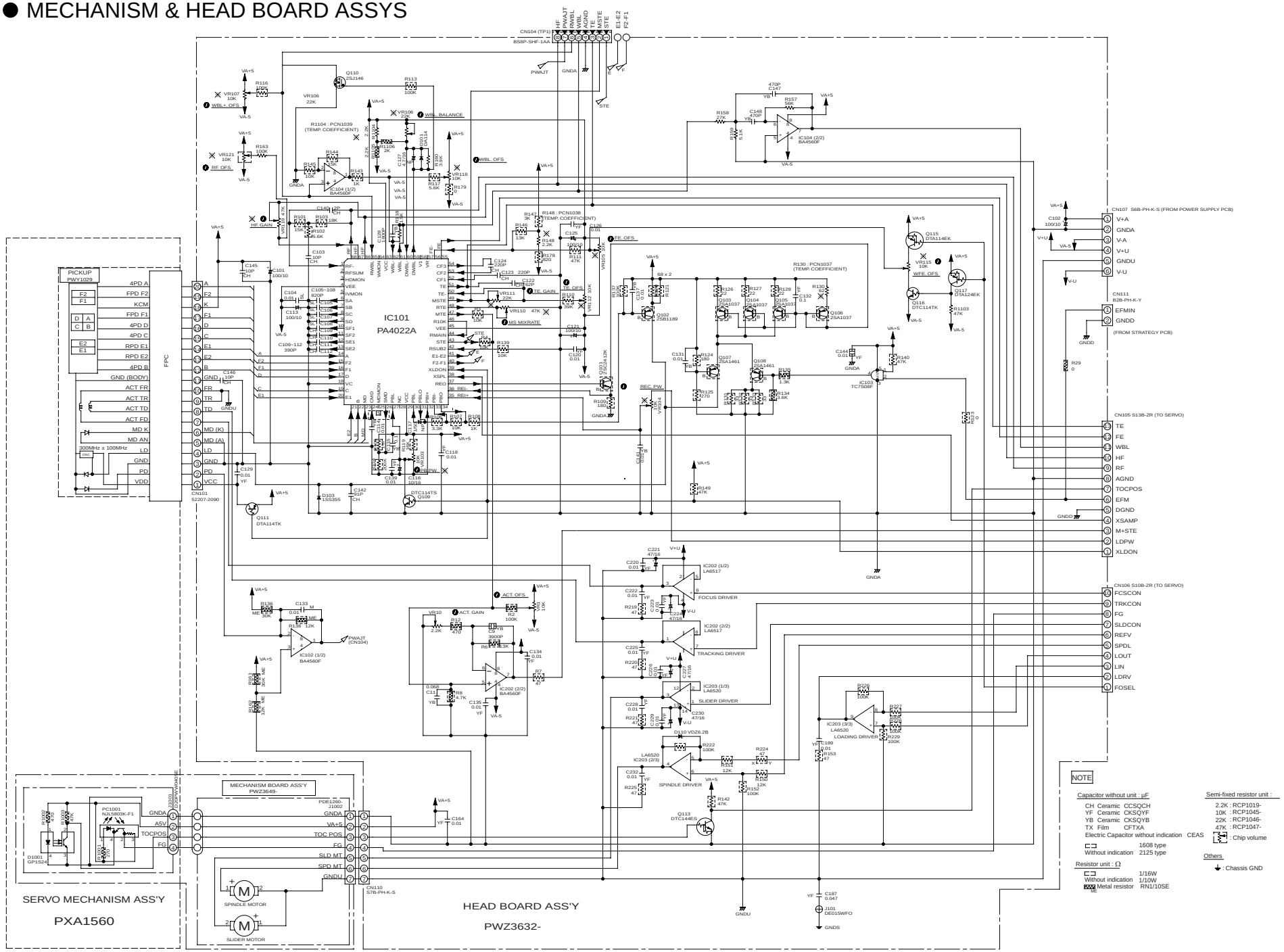
● AUDIO SYSTEM BLOCK DIAGRAM



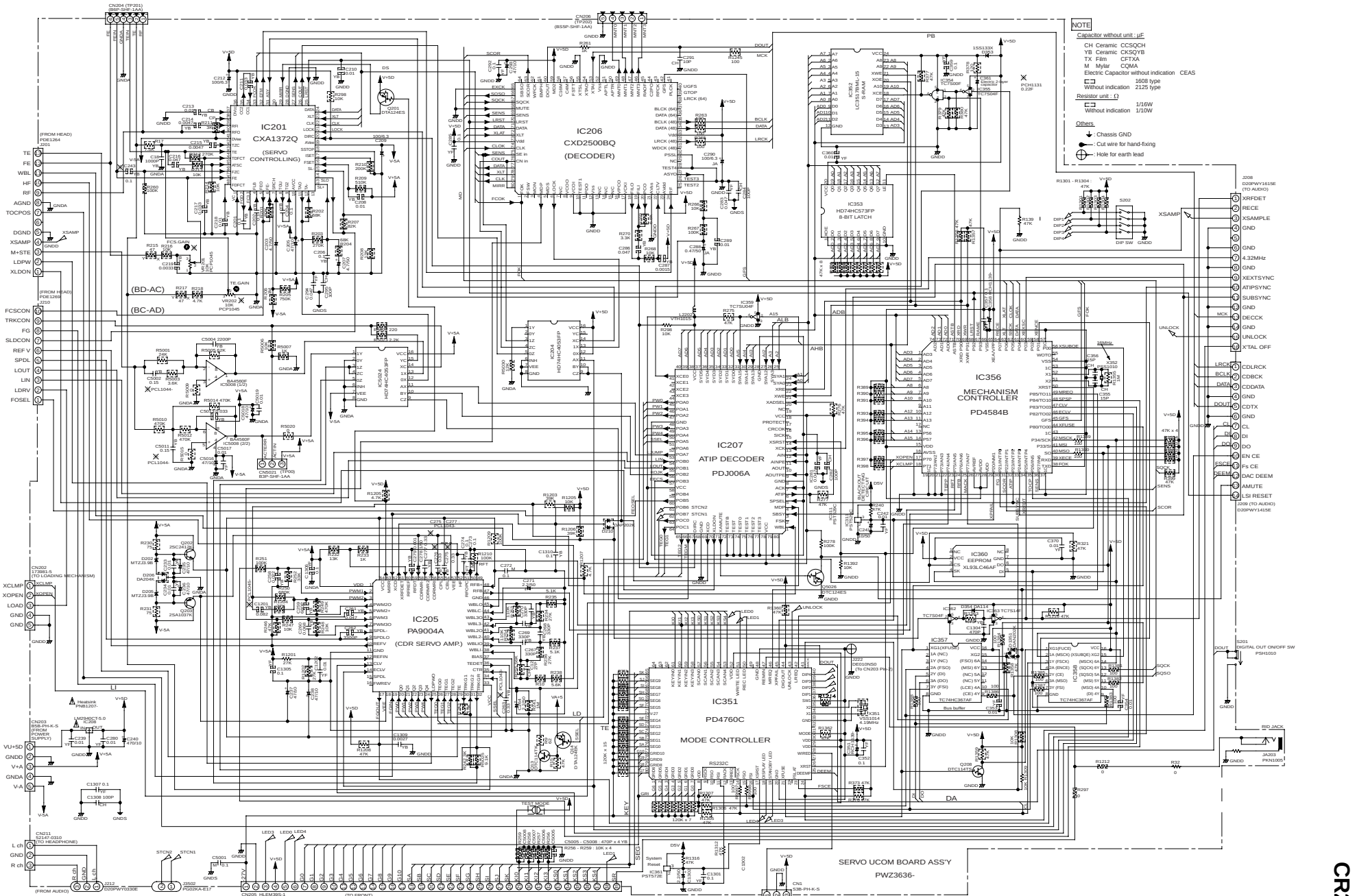
● CONNECTION DIAGRAM



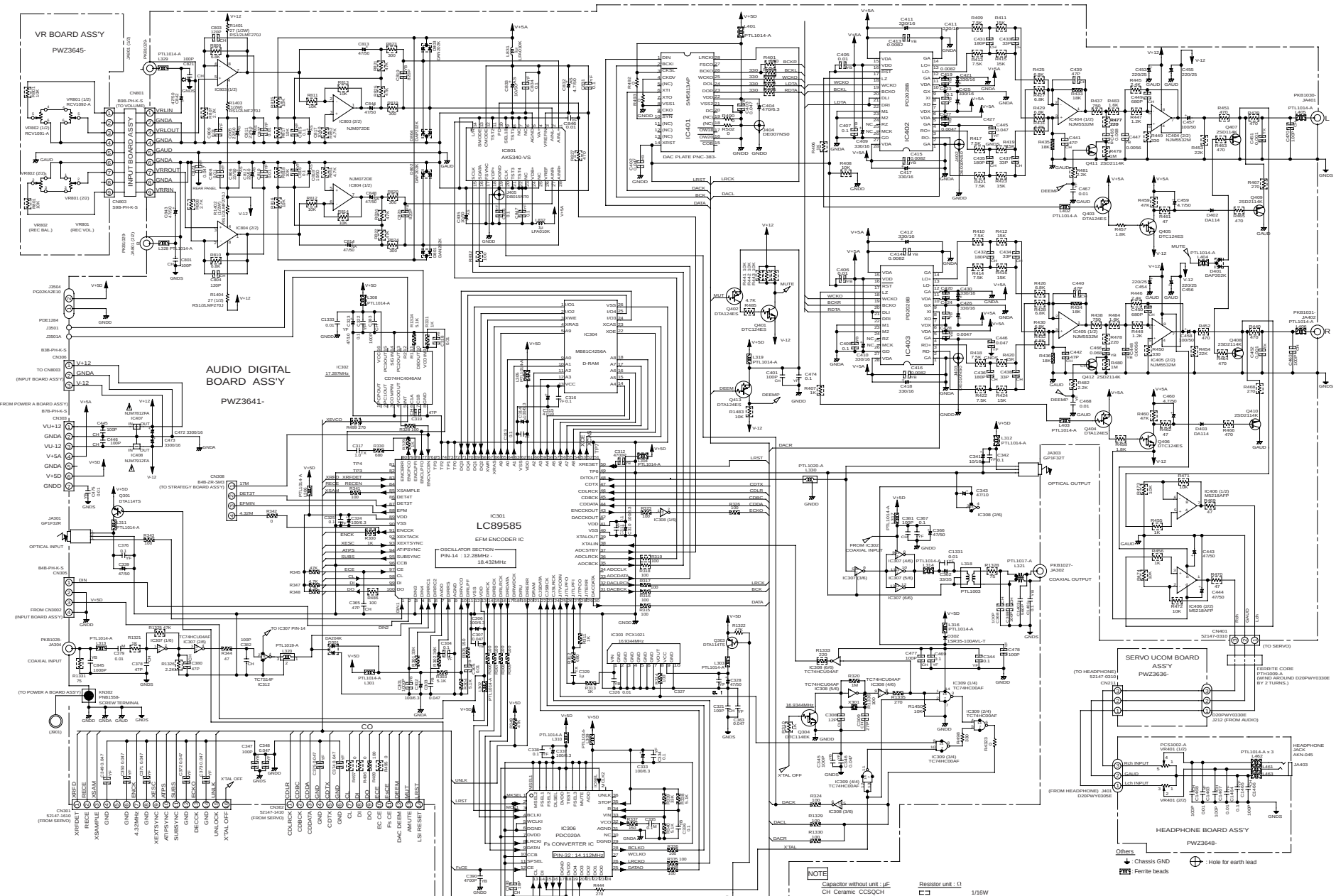
● MECHANISM & HEAD BOARD ASSYS



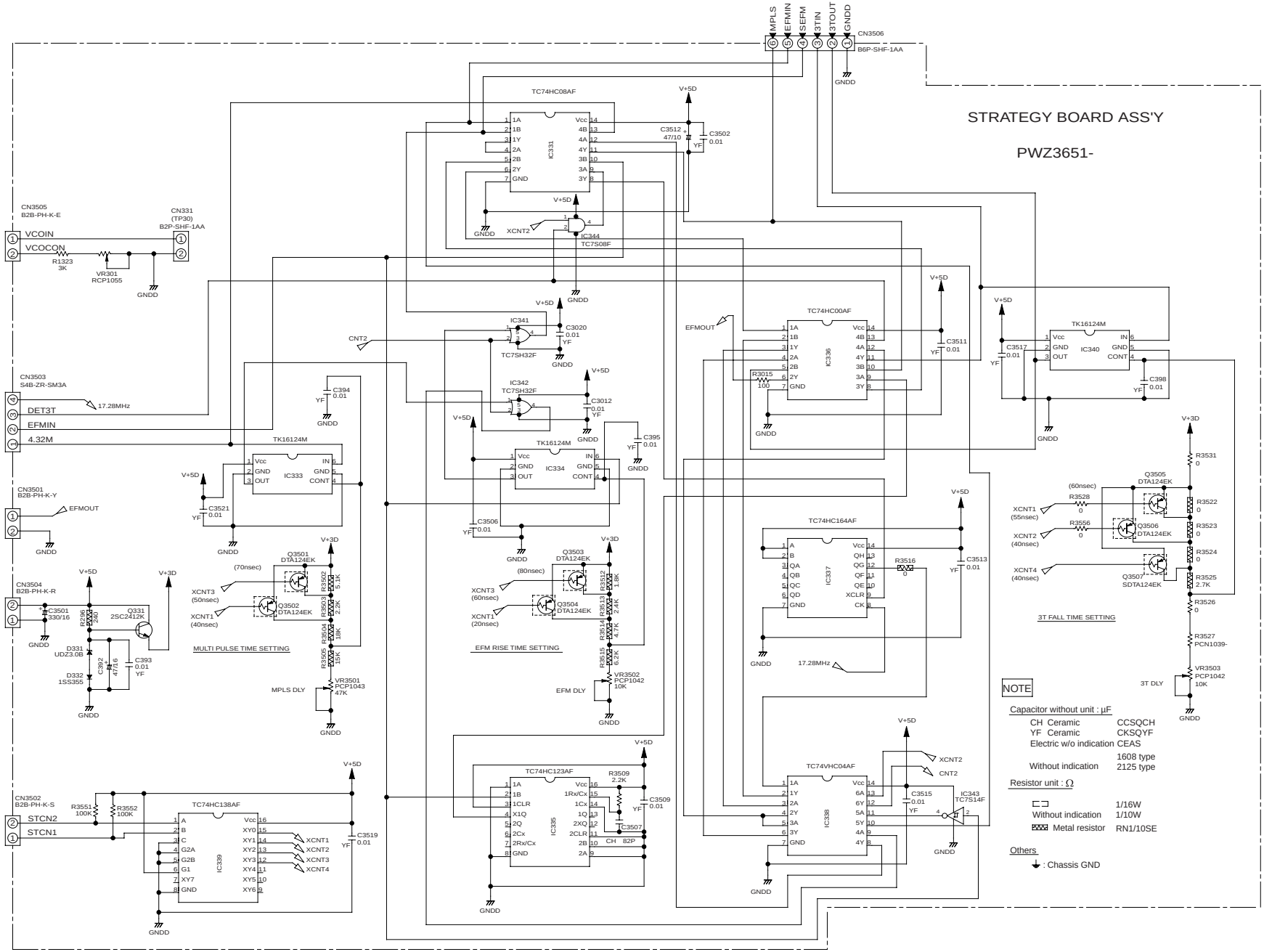
● SERVO UCOM BOARD ASSY (1/2)



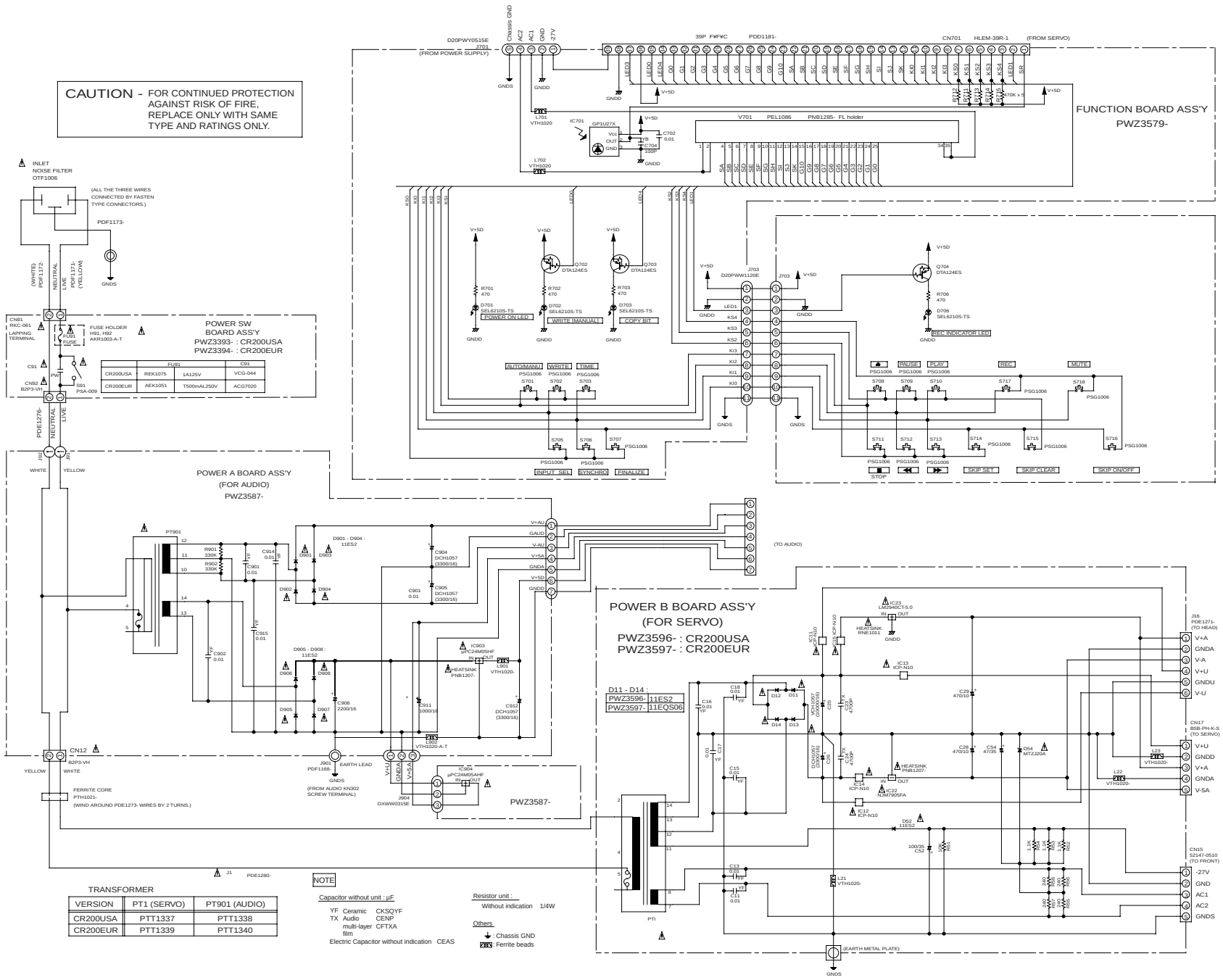
● SERVO UCOM (2/2) / AUDIO DIGITAL / HEADPHONE BOARD ASSYS



● STRATEGY BOARD ASSY

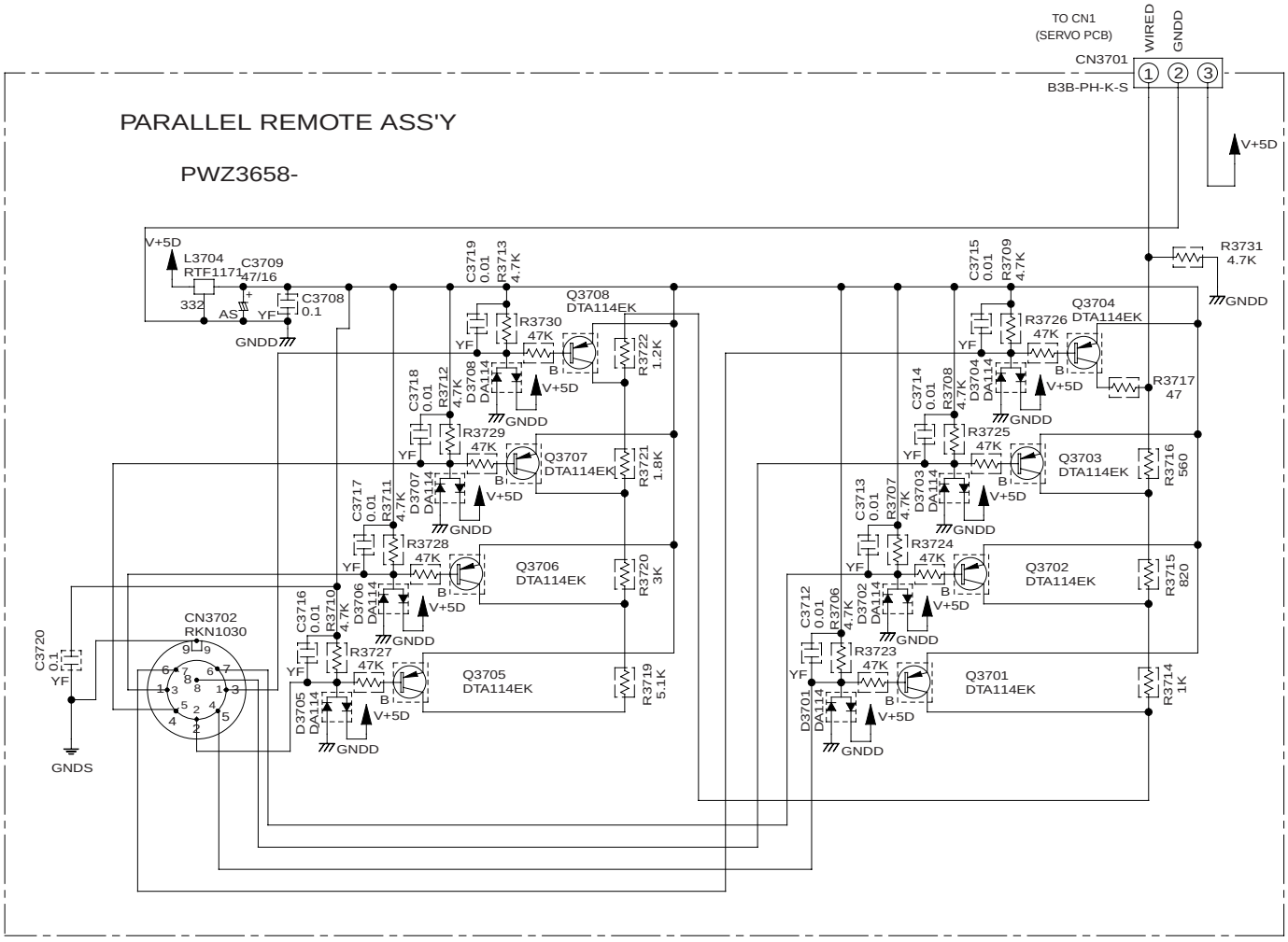


● FUNCTION / POWER A & B / POWER SW BOARD ASSYS



VERSION	PT1 (SERVO)	PT901 (AUDIO)
CR200USA	PTT1337	PTT1338
CR200EUR	PTT1339	PTT1340

● PARALLEL REMOTE BOARD ASSY



NOTE

Capacitor without unit : µF

CH Ceramic CCSQCH
YF Ceramic CKSQYF
NP Electric CENP
Electric Capacitor without indication CEAS

⊏⊐ 1608 type
Without indication 2125 type

Resistor unit : Ω

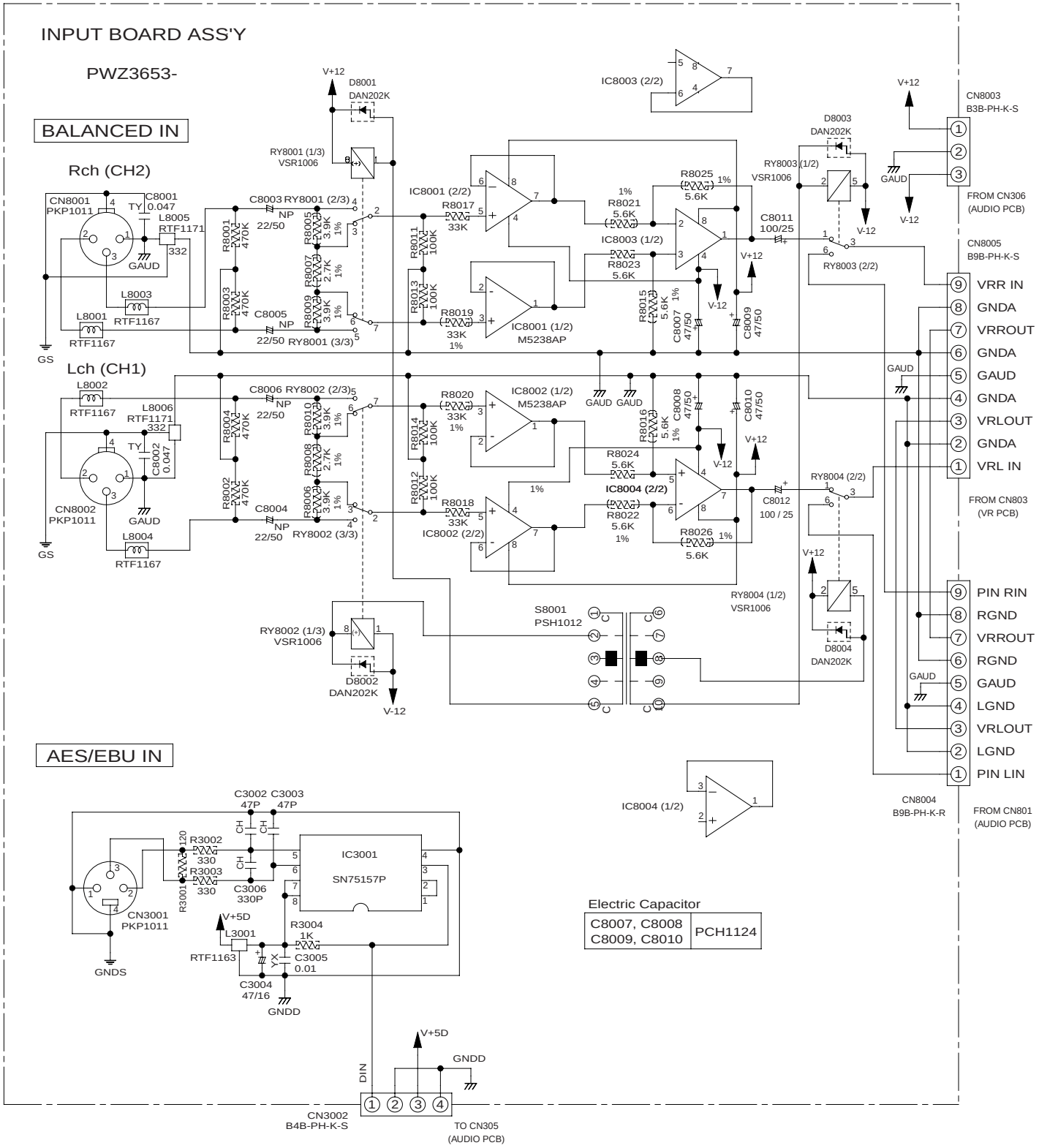
⊏⊐ 1/16W
Without indication 1/10W

Metal resistor RN1/10SE

Others

⏚ : Chassis GND

● INPUT BOARD ASSY



8. TROUBLESHOOTING

8-1. Service Number Display

- The CR200 displays the “CHECK” or “CHECK” “DISC?” prompts during abnormal operations and it stops.
- When the STOP or CLEAR key on the remote control unit Model 8317 is pressed continuously for about 10 seconds, the last service number will be displayed even though the CR200 is once turned off and back on.
- To correct the error, check the “Checkpoint” device and its surrounding circuit indicated in the table below.

8-2. Service Codes and Countermeasures

Code	Contents	Location of fault	Cause	Checkpoint
H0 H1	Unit does not operate.	H0: Communication is not properly made between mechanism and mode controllers. H1: Fault on mechanism controller is detected.	• Faulty soldering • PCB pattern is shorted or open. • Parts next to each other is shorted. • Faulty power supply	IC356, IC357, IC207, IC358, IC352, IC353
H2	Recording preparations cannot be performed and tray does not open. (“CHECK” is displayed.)	H2: Voltage error on Mechanism controller pin-22, 23 and 24. (See page 42 to check voltage.)		IC205
H5	Recording is impossible. (“CHECK” is displayed.)	IC360	• IC 360 is faulty.	IC360
L*	Unit stops operating while tray is open/close. (“CHECK” is displayed.)	Fault on loading section is detected.	• Faulty tray position sensor. • Faulty loading motor. • Faulty soldering • PCB pattern is shorted or open. • Faulty power supply.	IC203
E*	Operations stop when disc is inserted, playback start is requested, REC/PLAY is requested and operations are acknowledged. (“CHECK” is displayed.)	Fault on slider section is detected. • Pickup cannot be moved to designated position.	• Flexible cable is not properly connected. • Faulty drive circuit. • Faulty TOC position SW. • Faulty soldering. • PCB pattern is shorted or open. • Faulty power supply.	D1001, IC203, IC201, IC206
P*	Unit stops when disc is inserted without reading internal information. (“CHECK” is displayed.)	Fault on spindle section is detected. • Disc is placed upside-down. • Disc with scratches or dusts is inserted. • Disc does not rotate regularly. • Designated signal cannot be obtained from disc.	• Faulty spindle motor. • Faulty spindle drive circuit. • Error in FG detection. • Faulty WBL circuit. • ATIP or subcodes cannot be read.	PC1001, IC202, IC201, IC206
C*	Operations stop before REC/PLAY is set. (“CHECK” is displayed.)	Fault on recording laser power is detected. • Disc with scratches or dusts is inserted. • Proper recording power is not output. • RF is not properly detected.	• Error rate is high. • Faulty laser diode. • Error in RF detection. • Faulty RFT, RTB circuit. • Insufficient recording power. • Faulty soldering. • PCB pattern is shorted or open.	IC205, IC101, IC362, IC363
F*	Operations stop before playback or recording. (“CHECK” is displayed.)	Fault on pickup section is detected. • Disc with scratches, dusts, etc obstructs operations and unit stops. • Proper laser power is not output. • Not focused.	• ATIP or subcodes cannot be read. • Faulty laser diode. • Faulty focus drive circuit. • Faulty pickup. • Faulty soldering. • PCB pattern is shorted or open. • Faulty power supply.	IC206, IC203
A*	“CHECK” “DISC” is displayed and unit stops during operations related to recording.	Stop is detected during recording. • Disc with scratches, dusts, etc obstructs operations and unit stops.	If hardware problems occur before A* or B* is displayed, unit stops with displaying service codes other than these. Consequently, these service codes are displayed only when disc is faulty. Faulty soldering, shorted / open PCB pattern and faulty power supply would cause same symptom.	
B*	Same as “A*” above. Internal information on disc cannot be read. Unit stops when disc is inserted.			

NOTE : * indicates the mechanism mode listed in the chart below.

No.	Mechanism Mode	No.	Mechanism Mode	No.	Mechanism Mode
0	PLAY	5	SETUP	A	REC
1	OPEN	6	TOC read	B	TOC REC
2	STOP	7	-	C	OPC
3	-	8	SEARCH	D	TOC check
4	-	9	REC/PAUSE	E	PMA, actual pause recording

8-3. Judging Method of Unit

1. Look into the symptom thoroughly

- Check the location of fault (optical, electrical or mechanical system).
- Check if the disk is okay or faulty.
- Check if external unit connected to the CR200 is faulty.

2. Remembering the operation flow chart

Example of fault : The CR200 does not play.

- If the initial operation is completed.
- If the pickup is at initial position.
- If the laser diode is lighting.
- If the LD ON signal is output.
- If the lens is making the sweep operation.
- If the spindle is rotating.
- If the spindle is locked.
- If the FG signal is output.
- If the proper laser power is output.
- If the RF signal (eye pattern) is clear.

8-4. Judging Method of Pickup

Item	Checking Method
If the slider operation is normal ?	• Check the slider circuit and mechanism in the TEST mode.
Check if the laser diode is lit.	• If not, check the LD ON signal. • If the lens is dirty, clean it and check the RF level before and after cleaning.
Check if the lens is moving up/down.	• If not, check the actuator, FSC and TRK coil. • Check if the actuator is bent by the contact with cleaning disc, etc.,

8-5. Typical Cause & Symptom

Cause	Frequency	Symptom
The laser diode is not lit. The laser diode is deteriorated.	* * *	• The unit does not focus-lock. • The RF level is not normal. (Normal value : 1.2Vp-p at middle of test disk) • The RF waveform is dirty.
The lens is dirty.	*	• The FSCG or TRKG is small.
The coil is cut or broken.	* *	• TRK : The unit cannot close the TRK servo. • FSC : The unit cannot move the lens up/down.
The actuator is bent.	* * * *	• The TRK error level is small. • The unit cannot search the designated position.

8-6. Typical Faults on CD-R

1. Signal skipping or interruption
   - There are scratches, dusts and / or fingerprints on the disc.
   - The pickup is faulty.
   - Misalignment (Screw, etc.).

2. Signal skipping or interruption occurs when the disc is recorded and then played back on the same CD-R unit.
   - The recording power is too low.
   - The pickup is faulty.
   - Some of the section on the disc where dusts were attached could not be properly recorded.

3. SEARCH operation cannot be executed.
   - AC voltage is too low (-15% or more).
   - The gear in the servo mechanism is faulty (scratches, etc.).
   - Misalignment (Screw, etc.).
   - The pickup is faulty.

4. The unit cannot be put into REC-PAUSE mode.
   - The recording power is too low.
   - The pickup is faulty.

5. The tray cannot be open.
   - There are scratches or dusts on the FG detection photo reflector pattern attached to the bottom side of disc table.
   - The wires inside the unit get entangled.
   - The oil put in the loading mechanism is too less.

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